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The study reported in this monograph constitutes the second step in a program of research undertaken by the center to identify the concomitants and determinants of effective teaching for adults.

The report is organized into two general sections. Chapter 1 is an introduction and a summary of the procedures, findings, and implications of this study. The remaining chapters contain technical information and data concerning all phases of the study: other research in this area; methods used in the present study; the factor analysis of teacher behavior; analysis of direct relationships found between teacher behavior and student learning; interactions between teacher behavior and certain student and classroom characteristics in their effects on learning; and intensive analyses of the teaching styles used by four of the teachers in the sample.

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Report for 1962

PROJECTED NEEDS FOR FACILITIES BASED ON THE METHODS OF TEACHING

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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Western Reserve University
School of Medicine

DIVISION OF RESEARCH IN MEDICAL EDUCATION

Cleveland, Ohio

May 1962

ED000822

WESTERN RESERVE UNIVERSITY

SCHOOL OF MEDICINE

DIVISION OF RESEARCH IN MEDICAL EDUCATION

Report for 1962*

Projected Needs for Facilities Based on the Methods of Teaching

*Prepared for the Committee on Medical Education and General Faculty of the School of Medicine to serve as reference material for discussion of facilities that are being planned for the future. The briefest summary of the issues is found in Table 5, pages 17 and 18. The extensive appendices are designed to document the briefer text.

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Introduction

It is a great privilege to participate in the planning of new facilities for students in the School of Medicine and the teaching hospitals. In cooperation with the Committee on Medical Education, the Division of Research in Medical Education has prepared this report to aid in the discussion concerning the program of medical education in the future. Special attention is given to the relationship of methods of teaching and learning to the need for particular facilities. Facilities are designed to meet certain education purposes. They are a means for implementing the learning by the student. Accordingly, this report attempts to present a sequential analysis of objectives of medical education leading to questions about facilities.

The events of the preceding sixteen years have been reported (1-26) and are outlined in Figure 1. Planning for the next sixteen years, projecting to 1978, is indicated by listing in order the steps that are believed essential, at all times, for deriving a program of medical education. This sequence is used in the following eleven sections but with emphasis on Section 6, Methods in the Teaching-Learning Process; and, Section 7, Facilities for Medical Education. The appendices are available for more detailed reference.

It is now widely accepted that knowledge in medicine and the biological sciences has grown so rapidly that it is impossible for any one person to know it all. Medical educators have recognized that the process of medical education is necessarily a selective one. Students need to learn selected material; the faculty needs to select the material to be learned and to guide the student in the process of learning. And both students and faculty are limited by time. It is also accepted that students need to learn to educate themselves and to work through problems in each of the areas of their education.

Principle Hypotheses. Throughout this report the principal hypotheses that are considered may be stated as follows: (23,24)

> The student will be given increasing responsibility to educate himself in learning information and using information in the approach to problems.

The growth of skill in self-education and problem solving are believed to represent two significant requirements in the program of medical education. The methods for teaching and learning, that are proposed in this report, depend on these principle hypotheses.

Projections into the Future. Developing methods for self-education by the student and the preparation of problems to be used by the student for learning puts new demands on the faculty, on the student, and requires new facilities. However, it may be possible for the student, in the future, to work through a series of well designed problems and skills in each field -- at his own pace -- and to have these achievements evaluated. The student could then qualify when he was ready. Much of the detail of such a plan cannot be envisioned as yet and must await actual experience in the coming years. Facilities are proposed here that would allow independent

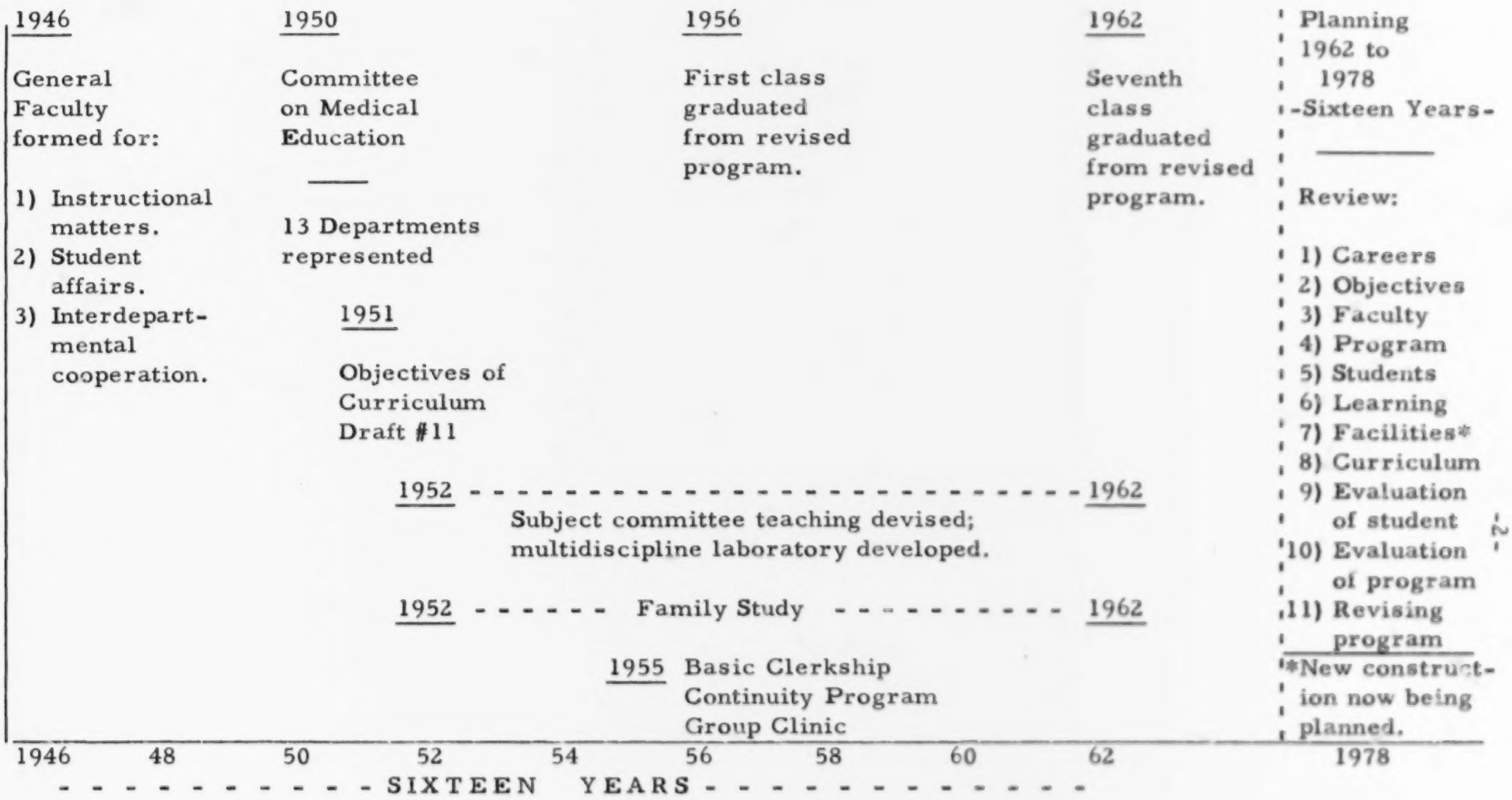
1946
General Faculty formed for:
1) Instructional matters.
2) Student affairs.
3) Interdepartmental cooperation.
1950
Committee on Medical Education
13 Departments represented
1951
Objectives of Curriculum Draft #11
1952 - 1962
Subject committee teaching devised; multidiscipline laboratory developed.
1952 - - - - - - Family Study - - - - - - - - - - 1962
1955 Basic Clerkship
Continuity Program
Group Clinic
1956
First class graduated from revised program.
1962
Seventh class graduated from revised program.
Planning
1962 to
1978
-Sixteen Years-
Review:
1) Careers
2) Objectives
3) Faculty
4) Program
5) Students
6) Learning
7) Facilities*
8) Curriculum
9) Evaluation of student
10) Evaluation of program
11) Revising program
*New construction now being planned.
1946 48 50 52 54 56 58 60 62 1978
- - - - - - - - - - - SIXTEEN YEARS - - - - - - - - - - -

Figure 1. A view of thirty-two years in a program of medical education, projecting to 1978.

study by students. This study could enhance the teaching-learning process for the student and might be the wedge into breaking the lock-step of the curriculum by allowing students to qualify when they were ready. A start has been made in the problem-solving approach in medical education as reported to the School of Medicine by Harris*, Horrigan, Ginther and Ham and as used by Eckle and Post, and by many others, especially in the case method in the clinical fields.

Section 1. Careers in Medicine and Medical Sciences.

A program of education in medicine and medical sciences must begin with a consideration of the professional contributions that can be made to society by the future physicians and scientists. This projection is based on several considerations such as the accumulated knowledge of the day, the methods of education (13) for the available careers or for careers that are being developed. We are in a period of markedly increasing specialization in medicine and in medical science so that the faculty must select carefully the content and the sequence for students to learn the basic and the specialty information. Two aspects of careers are presented here, first, the faculty concepts recorded in 1959 and, second, the career study that has been initiated of all graduates of the School of Medicine of Western Reserve University.

A study was made in the Spring of 1959 of the faculty attitudes toward careers of future graduates of the School of Medicine and reported by Horowitz and Herzberg (22). Returns from 230 faculty members (79 percent clinical, 21 percent preclinical) showed agreement that most graduates should enter medical practice. It was suggested that from 20 to 50 percent of the class enter general practice, the higher percentages being recommended by preclinical men holding Ph.D. degrees. Most of the faculty (80 percent) recommended that from 5 to 20 percent of each class should enter non-practice fields such as teaching and research. Sixty-seven percent of the faculty wanted 5-10 percent of the graduating class to follow careers in the biological sciences. As stated by the authors (22), "The faculty's estimates of those it would like to enter academic medicine and research medicine seem to be rather large in comparison with recent estimates of the proportion of students (6 percent) in a number of medical schools expecting to pursue careers in teaching and research."

The actual careers of M.D. and Ph.D. graduates of the School of Medicine are being studied** by Betty H. Mawardi, as reported in Appendix A. The first year's program or general survey portion of the research has been completed and gives the faculty an estimate of the diversity of careers. Selected analyses are attached in the appendix and the complete set of data and charts will appear in the final report of the study.

---

* Reported Gates Mills 1961 and submitted for publication, J. Med. Education.

** Supported by a grant from the Commonwealth Fund of New York.

Briefly, from the data one observes that of the 2,675 living M.D. graduates of Western Reserve University, two-thirds of all these physicians are in private practice. One-half of all graduates are specialists in private practice and seventeen percent are general practitioners. One-third of all the M.D. graduates are in practice in such general fields as general practice, internal medicine and pediatrics. The total number of physicians full time in medical schools, in hospitals and research is eight percent. Two hundred and twelve M.D. graduates hold appointments as assistant professor or higher in 55 medical schools throughout the United States. The trends in specialties and the choices of graduates since 1956 are shown in Appendix A.

Dr. Mawardi is now beginning a study of the careers of selected members of the alumni as outlined in the proposal. During the next year, a random stratified sample of approximately one hundred fifty general physicians and specialists will be interviewed to obtain career information at more depth. The questions to be asked are still in the process of pre-testing and revision. The study will continue during at least two years.

Section 2. Objectives of the Program of Medical Education

The objectives of any program of medical education are derived by the faculty based on their projection of future professional roles of graduates. Development of these objectives is complex because the subjects themselves are complex and the methods of education must be selected to fit them. Currently the School of Medicine of Western Reserve University is using the statement derived by the Committee on Medical Education and submitted to the General Faculty as a working document in the "Objectives Concerning Curriculum," Draft #11, April 10, 1951. This statement continues to serve as a basis for the program of medical education and is reproduced in Appendix B. Obviously, it is subject to revision.

Section 3. Faculty Leadership of Students

The faculty guidance of the student is believed to be the next step in the educational sequence and several hypotheses are suggested here. The student will look to the faculty for guidance (19, 20) and will continually ask two major questions: (1) What does the faculty believe is important and (2) how am I doing? The student will be alert and rapidly responsive to the emphases of the faculty and particularly to the criteria used in evaluating him personally. There is no doubt that the faculty members set the educational environment by showing what they want of the student and by their counseling. This is done in many ways: by the requirements for learning and performance, the example set by the faculty, the responsibility delegated to the student. Leadership in subjects and in teaching resides with the faculty. It will be the responsibility of the faculty to select the program for the student.

In the biological sciences, for example, it is observed that the student will work hard to understand and integrate basic principles if he is asked to do so and is evaluated on it. Conversely, if he is asked to regurgitate masses of poorly understood detail, he will work toward this process. In clinical fields, if he is evaluated on a mature knowledge of medicine and excellence in patient care, he will respond. If independent study, reading, analysis and reporting on biological and clinical problems are required and evaluated, the student will proceed vigorously with these processes of self-education. If he is required to do a study in depth, to conduct a project, or to write a thesis and is evaluated on the excellence of his scientific method of approach and his writing, he will proceed toward this goal. If he knows that free time and electives are available and that he is expected to demonstrate his own initiative for his education and for development of his unique interests and objectives, he will try to accomplish these objectives. If he knows that he is expected to demonstrate mature and responsible behavior as a person and as a student physician, with an increased understanding of himself and of patients, he will work toward these goals. If he knows that internships are attained by what the clinicians say about his performance with patients, he will work for this.

It is apparent that the student behavior will be shaped in a large part by the faculty expectations and demands. If the major emphasis is placed on examinations, the student will respond by putting his major effort into cramming for examinations. Accordingly, the faculty must derive its methods of evaluation of students from the objectives of the program itself and must inform the student as completely as possible of the objectives and the criteria that will be used in judging performance. Methods of evaluation are limited indeed and require continuing study and improvement. Different types of evaluations and examinations are required for preclinical and clinical years and each has its value and limitations. See also Section 6 on examinations, pages 18 and 22.

Section 4. The Student and Learning.

It is recognized that there will always be diversity of students' interests, of learning performance and of careers (33). The progress, development, change and learning of each student may best be studied in relation to his own unique previous performance, while also comparing his learning with the performance of students of his own class and those in other schools (28). The following three areas are selected for emphasis since they are considered essential parts of the learning process and represent an hypothesis developed for test by the Division of Research in Medical Education and John R. Ginther of the Department of Education of the University of Chicago (24). The experiment by Harris, et al., is part of the program of test.

(i) Student Responsibility. The first part of the hypothesis was agreed to in Draft #11 of the objectives (Appendix B), namely, "It is essential that a M.D. student be treated as a maturing individual, as a colleague and as a student in a graduate professional school who is given increasing responsibility for his own education, for a knowledge of medicine and for the care of patients". The question has been asked in the experimental program in teaching hematology: Can and will the student take the responsibility to learn on his own without the use of lectures? It is believed an essential that the student develop proficiency, effectiveness and satisfaction in self-education so that he may carry this method over to his life beyond medical school. The delegation of this responsibility to the student should free the faculty to perform educational activities more appropriate than giving out information. Also, the student may proceed to study at his own pace and by his own methods so that increased freedom from a lock-step curriculum may be evolved in the future. This should allow the development in the students of their individual capacities for independence of approach and give them command of much of their time.

(ii) High Levels of Mental Functioning. The second part of the hypothesis is that the student must develop effectiveness in approaching the solution of problems and the utilization of pertinent information. For high levels of mental functioning, the student must learn how to evaluate the significance and limitations of available knowledge, must correlate and integrate bodies of knowledge. He must think critically as he attempts to apply what is known to the problems in preclinical and clinical fields. This approach to medical education was agreed to in 1960 by the General Faculty (23).

The development of the higher mental processes should enable students to obtain a fuller understanding of a given discipline or subject field than is the case when higher processes are not developed. Such functioning seems to be manifest in those doctors who are, for example, the best diagnosticians and most creative research men. It would seem appropriate to test the hypothesis that increased ability in problem solving will result in better diagnostic and investigative performance.

(iii) Acquiring Information and Knowledge. It is agreed that the student must obtain an adequate body of information, skills, facts, principles and methods in the preclinical and clinical fields of medicine. These represent the building blocks of the educational process. When the information has been used, understood and correlated, it becomes meaningful. There may be longer retention of knowledge that has been used actively in the critical application to problems.

(iv) Education for Problem Solving. Education for problem solving includes helping the student to develop methods of learning and to assume responsibility as a graduate student (23, 24). This implies the ability to evaluate his own progress and to assume responsibility for himself as a student and as a person. Thus, problem solving becomes a broader concept, as illustrated below in Figure 2.

Figure 2. A Concept of the Relation of Problem Solving to Learning

I. Problem Solving in Medicine

Learning Information	Use of Information
knowledge	analysis
facts	integration
skills	application
principles	critical thinking
methods	inquiry

II. Development of methods of learning to be used by the student.

III. Responsibility delegated to the student as a member of a graduate professional school including self-education, self-appraisal and responsibility as a person. He will be studying biologic sciences and care of patients.

It is assumed that the success of the student in solving problems in the fields of medicine is closely associated with his success in solving problems in his education as a responsible graduate student.

Section 5. Development of a Program from Objectives

The definition of detailed objectives for each subject has been made by the faculty based on the preceding four steps. Each subject committee or planning group will select what should be learned by the student as factual information and how a student should use his information in approaching problems. Until the detailed objectives are agreed upon, it is impossible to select the teaching-learning methods that are appropriate to any preclinical or clinical subject. Similarly the facilities cannot be designed until the program is planned. It is probable in the future that increasing emphasis will be given to self-education so that the student will learn how to obtain his own knowledge and use it in solving problems.

The outline of the subjects that are taught by committees for all four years are shown in Figure 3. The proportion of time delegated to Phases 1 and 2, the methods of instruction* and the participation of faculty members in planning and teaching are shown in Tables 1-4. No detailed presentation is made here of the subject material itself. These data show the large amount of time given to lecture, especially in Phase 2. It is a challenge to the faculty to balance the number of lectures, the kinds of laboratory exercises and other teaching methods to fit the educational plan as discussed in the next section.

*Prepared by S. J. Cooperstein.

PHASE 1 Normal Biology of Man		PHASE 2 Pathologic Physiology-Principles of Medicine (54 weeks)			PHASE 3 Clinical Medicine-Patient Care (16 months)		OBJECTIVE
Projects 34 weeks last month		Phase 2A (34 weeks)	Projects last month	Phase 2B (20 weeks)	Biologic Science and Writing Thesis Report on Project		Learning science and scientific approach
Orientation Cell biology Tissue biology neuro-muscular Cardiovascular respiratory Metabolism Endocrine Review - - - - - - - - - - - - - *Biostatistics, Introduction to library	Anatomy of Infant Cadavers	Introduction to disease Infectious disease Chemical agents Cardiovascular Respiratory Urinary disease Hematopoetic Gastro-intestinal Review - - - - - - - - - - - - Psychiatry 1 or 2 hours/week	Anatomy on Adult Cadaver (second and third years)	Musculo-skeletal system Nervous system Ophthalmology Female genital disease Endocrine and reproduction Otolaryngology - - - - - - - - - - Legal medicine; psychiatry 1 hour/week	Required Basic clerkship Medicine or Pediatrics Basic surgical clerkship Ambulatory clerkship Group clinic Obstetrics and Gynecology Sub-specialty clerkship	Months 4 2 2 2 2	Learning biologic and medical sciences
Preceptor #1 Infant and Family Study		Preceptor #2, #3 Continuation of Family Study, Clinical Science			Preceptor #4 Continuity Program		Thinking as a physician
Free Time Three half days during the week					Vacation Electives Clinical Teaching Research Biologic science	Months 2 2 Total 16	Self-education
First Year		Second Year		Third Year	Third Year	Fourth Year	

Figure 3. Schedule of subject committees and program during four years (1961-1962)

TABLE 1 - Curricular Time

Summary of Curricular Time in All Activities During Phases 1, 2A and 2B in the First Two and One-Half Years for 1959-1960

Preclinical Subject Committees	Year	Duration	Time	Curricular Time
Phase 1	First	30 weeks	851 hours	
Phase 2A	Second	30 weeks	813 hours	
Phase 2B	Third	20 weeks	485 hours	
		80 weeks	2,149 hours	56%
Projects:				
Phase 1		4 weeks	144 hours	
Phase 2A		4 weeks	144 hours	
		8 weeks	288 hours	8%
Clinical Science				
Including psychiatry (69 hours), legal medicine (15 hours), ophtholmology (6 hours), otolaryngology (6 hours).			352 hours	9%
Free Time				
Scheduled three half days during the week			1,020 hours	27%
TOTALS	2.5 years	88 weeks	3,809 hours	100%

TABLE 2

Curricular Time by Methods of Instruction

Phase 1 (First Year) (1960-1961)

Subject	Hours			Major Department Responsibility
	Lecture	Lab	Other*	
Orientation	6	-	2	- - - -
Cell Biology	76	101	43	Biochemistry, Microbiology, Histology, Physiology
Tissue Biology and Neuromuscular	57	70	48	Physiology, Anatomy
Cardiovascular-Respiratory	58	55	53	Physiology, Anatomy
Metabolism	55	58	43	Biochemistry, Physiology, Anatomy
Endocrines and Reproduction	33	40	24	Physiology, Anatomy
Biostatistics	14	14	7	Preventive Medicine
Clinical Science	27	-	66	Unclassified
Research Projects			(144)	- - - -
TOTAL	326	338	430	1,094 hours
PERCENT	30	31	39	

*Largely conferences and independent work.

TABLE 3

Curricular Time by Methods of Instruction

Phase 2 (Second Year and First Half of Third Year) (1960-1961)

Subject	Hours			Major Department Responsibility
	Lecture	Lab	Other*	
Phase 2A:				
Cellular and Tissue Injury	49	38	17	Pathology
Mechanisms of Infection	64	84	12	Microbiology, Pathology
Chemical Agents	48	12	--	Pharmacology
Cardiovascular	44	41	5	Pathology, Anatomy, Physiology
Respiratory	29	35	8	Pathology, Physiology, Medicine
Urinary	35	28	26	Pathology, Physiology, Medicine
Gastrointestinal	70	66	20	Anatomy, Pathology, Surgery, Medicine
Hemopoiesis	24	42	12	Pathology, Medicine Physiology
Clinical Science	22	--	102	Unclassified
Psychiatry	26	--	10	Psychiatry
Legal Medicine	15	--	--	Legal Medicine
Research Projects			(144)	Unclassified
Phase 2B:				
Musculoskeletal	55	39	2	Anatomy, Surgery, Pathology
Nervous System	99	66	22	Anatomy, Pathology, Pharmacology
Endocrines and Reproduction	116	51	28	Pathology, Anatomy, Obstetrics, Medicine
Clinical Science	10	--	62	Unclassified
Ophthalmology	6	--	--	Ophthalmology
Otolaryngology	6	--	--	Otolaryngology
Psychiatry	19	--	7	Psychiatry
TOTAL	737	502	477	1716 hours
PERCENT	43	29	28	

*Largely conference and independent work.

TABLE 4

Faculty Members Planning and Participating in Subject Committee Teaching (1961-1962) in Preclinical Fields

PHASE 1

First Year (34 weeks)		Faculty Members		
Subject Committees	Department	Planning		Participants
Cell Biology (221 hours)	Anatomy	1		2
	Biochemistry*	3		6
	Microbiology**	1		3
	Physiology	1		1
	Medicine			1
		6	totals	13
Tissue Biology and Neuromuscular (175 hours)	Anatomy*	2		5
	Biochemistry	1		1
	Pathology			1
	Physiology**	2		4
	Medicine			1
	Surgery	1		1
	Student Instructor			1
		6	totals	14
Respiratory and Cardiovascular (166 hours)	Anatomy**	2		3
	Biochemistry	1		1
	Physiology*	4		5
	Medicine	1		4
		8	totals	13
Metabolism (157 hours)	Anatomy	2		4
	Biochemistry*	3		6
	Microbiology	1		1
	Pathology			2
	Physiology**	1		2
	Medicine			6
	Pediatrics			1
	Student Instructor			1
		7	totals	23

*Chairman or **co-chairman of subject committees.

TABLE 4 (continued)

Subject Committees	Department	Planning		Participants
Endocrine and Reproduction (96 hours)	Anatomy	1		1
	Biochemistry	1		2
	Physiology*	2		7
	Medicine			6
	Obstetrics and Gynecology	1		1
		5	totals	17
Biostatistics (36 hours)	Preventive Medicine*	4		7
	Medicine			1
		4	totals	8
TOTAL - 851 hours				
PHASE 2A				
Second Year (34 weeks)				
Mechanism of Cellular and Tissue Injury and Repair (108 hours)	Biochemistry**	1		3
	Microbiology	1		1
	Pathology*	3		7
	Radiology	1		3
		6	totals	9
Chemical Agents (60 hours)	Pathology	1		1
	Pharmacology	5		4
	Medicine	1		2
	Psychiatry			1
		7	totals	8
Mechanism of Infection (160 hours)	Microbiology*	6		6
	Pathology	1		6
	Preventive Medicine	2		3
	Medicine	2		2
	Pediatrics			2
		11	totals	19

*Chairman or **co-chairman of subject committees.

TABLE 4 (continued)

Subject Committees	Department	Planning		Participants
Cardiovascular System (90 hours)	Anatomy	1		2
	Biochemistry			1
	Pathology	1		9
	Physiology	1		1
	Radiology			1
	Medicine*	5		16
	Pediatrics			1
	Surgery			2
		8	totals	33
Respiratory System (71 hours)	Anatomy	1		1
	Microbiology			1
	Pathology	2		7
	Preventive Medicine			2
	Radiology	1		1
	Medicine*	2		5
	Surgery			1
		6	totals	18
Urinary Tract (89 hours)	Pathology	1		8
	Medicine*	4		4
	Pediatrics	1		1
	Surgery	1		1
		7	totals	14
Gastro-intestinal Tract (235 hours shared with Hematopoetic System)	Anatomy	1		1
	Biochemistry			1
	Microbiology	1		1
	Pathology	1		2
	Medicine* **	5		7
	Pediatrics			4
	Surgery	2		14
		10	totals	30
Hematopoetic System (hours shared with Gastro-intestinal system)	Biochemistry			1
	Biology			1
	Pathology	1		10
	Medicine* **	3		14
	Pediatrics			1
	Radiology			1
		4	totals	28

TOTAL - 813 hours

*Chairman or **co-chairman of subject committees.

TABLE 4 (continued)

PHASE 2B

Third Year (20 weeks)

Subject Committees	Department	Planning		Participants
Musculo-Skeletal Systems (104 hours)	Anatomy	1		2
	Pathology	2		1
	Pharmacology	1		1
	Medicine	1		2
	Surgery*	5		6
		10	totals	12
Nervous System (191 hours)	Anatomy**	1		6
	Pathology*	1		2
	Pharmacology	1		1
	Physiology	1		1
	Radiology			2
	Medicine	2		6
	Pediatrics	1		2
	Psychiatry			1
	Surgery	1		5
		8	totals	26
Endocrine and Reproduction Systems (195 hours)	Anatomy*	2		2
	Biology			1
	Biochemistry			1
	Microbiology			1
	Pathology	1		13
	Pharmacology			2
	Preventive Medicine			2
	Radiology			1
	Medicine**	3		14
	Obstetrics and Gynecology**	2		10
	Pediatrics			3
	Surgery	1		3
		9	totals	53

TOTAL - 490 hours

*Chairman or **co-chairman of subject committees.

Section 6. Methods in the Teaching-Learning Process

There is great need for research in the teaching-learning process (27-41) so that the methods employed will be appropriate for the student to learn that which the faculty recommends. Two simplified expressions are developed below as hypotheses. Then, a list of methods now being used in the teaching-learning process is shown in Table 5 with an emphasis on learning information and the use of information in problem solving. The facilities that may be required are discussed in Section 7 below.

(i) Faculty teaching and student learning are related in the following crude expression:

TEACHING		LEARNING
by faculty instruction (I) by faculty challenge (C)	⟶	by student responsibility (R)

mutual understanding (U)

⟶

Factor (I) instruction indicates that the faculty develops the program and chooses the methods for learning. Factor (C) challenge indicates the requirement to the student in his understanding and use of information. It is proposed that these processes of teaching be done with mutual understanding (U) to fit the needs of the student. Responsibility (R) for learning resides with the student himself. It is believed that excellence in the factors (I), (C) and (U) will set an educational environment in which the student will take the responsibility to learn on his own.

(ii) The intellectual process of working through a problem are outlined in an oversimplified diagram in Figure 4 to show that taking the responsibility can result in learning for the faculty or the student.

(iii) The limitations of the above two expressions are their oversimplification and failure to specify the learning process involved. One cannot expect the faculty or the student to work out a program from such bare diagrams. Therefore, certain methods are described, as listed in Table 5, to suggest the various activities in the teaching-learning process. These methods are developed further below with reports from the literature given in detail in the appendix. All eight methods listed in Table 5 are now in use in varying degree of emphasis in the School of Medicine of Western Reserve University. This outline may serve to clarify discussion of the several kinds of teaching.

Table 5. Methods now being used in the teaching-learning process. The arrangement is made to emphasize the learning of information and then its use in problem solving. The facilities for each method are suggested for further consideration.

Methods used in teaching-learning process	LEARNING INFORMATION		USE OF INFORMATION		Facilities that may be required
	Faculty instruction, planning of program	Student learning information and skills	Faculty challanging student: problem approach, Socratic method	Student participating, performing in problems	
1. Lecture and demonstration.	Small groups or large classes of students may be instructed or informed in facts, skills, principles or the approach of the faculty. This may be a passive exercise.		The individual student or a large of students can be challenged and respond immediately in the lecture-demonstration. Faculty can demonstrate use of the problem-solving method.		Lecture room, AV-TV facilities. Response circuits.*
2. Laboratory exercise	Students may learn many facts, skills and principles by doing laboratory exercises. Student responsibility may be small in degree.		Students may initiate and perform laboratory experiments on their own and report results and interpretation. Student responsibility may be large.		Multidiscipline laboratory, special equipment.
3. Independent study as students' responsibility.	Faculty can orient student, select program, indicate references or provide syllabus, but student studies on his own. Study materials may be programmed.		Faculty needs to challenge the student's knowledge and his understanding and use of his information.		Individual study unit,** study materials, learning aids.
4. Working through problems in preclinical fields during four years.	Faculty needs to select and plan real problems that are of importance to the student		Faculty needs to test the student's approach and actual performance in solving of problems.		Individual study unit,** laboratory.

	LEARNING INFORMATION	USE OF INFORMATION	
5. Working through clinical problems during four years.	Faculty plans the sequence and pace for learning clinical skills, the disease processes and methods of examinations for factual information.	The case method can give responsibility to the student to participate with patients in study of their problems and in patient care.	Individual study unit,** clinical facilities, interview rooms
6. Research projects special studies.	Faculty selects special subject for students to learn investigative approach and may orient the student.	The bioclinical studies, special reports, the project and summer research are examples of students' own participation.	Facilities of faculty member, above units.**
7. Conference seminar, tutorial exercise.	Faculty chooses topics with care based on the study done by students.	The faculty asks, the students respond.	Conference rooms,* projection equipment.
8. Examination, performance in clinical studies.	The faculty chooses carefully the facts, and skills they believe essential for performance of students.	The faculty chooses carefully the higher processes they require of the student in using his information.	Development of examinations and clinical evaluation.

*An electrical communication system can be installed for each student's desk in the lecture room to allow immediate response to questions, recording of individual responses and visualization of the responses by the instructor.

**Information retrieval from the library.

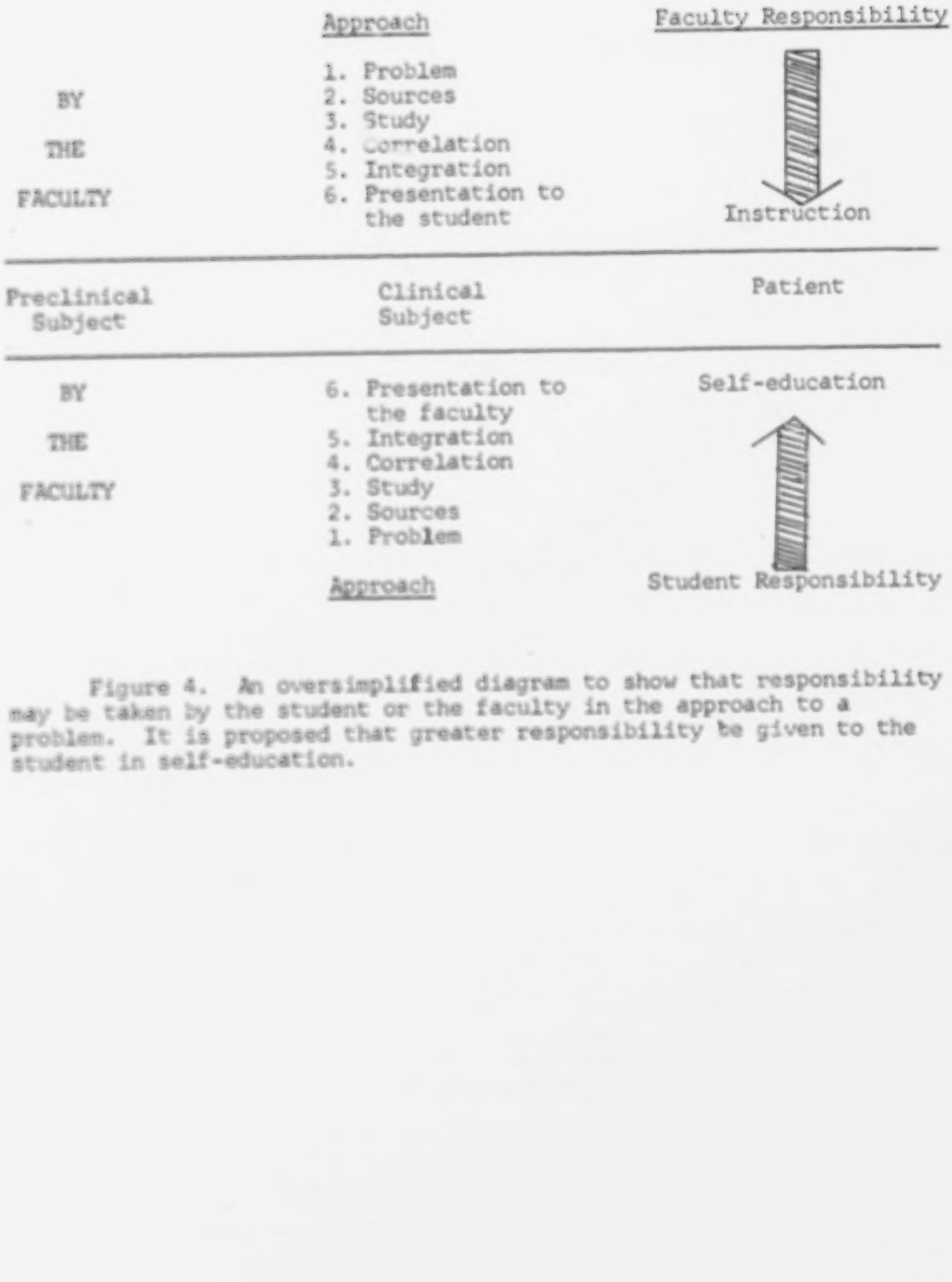

Figure 4. An oversimplified diagram to show that responsibility may be taken by the student or the faculty in the approach to a problem. It is proposed that greater responsibility be given to the student in self-education.

1. Lecture-Demonstration. There is ample evidence that the lecture-demonstration can serve several purposes. Its significance and limitations may be summarized as follows. The lecture-demonstration can inform the student of facts, skills, methods, principles, new information, approaches of the faculty. For this the faculty has used the lecture, the demonstration, and a variety of audio-visual methods. It is apparent that systematic lectures, televised and taped lectures can be assembled, as can programmed learning materials and motion pictures to aid the student in learning large amounts of facts. A summary is given in the Appendix C of the review by Winslow R. Hatch* (32) on the "Science of Teaching", relating to the lecture.

There are two major limitations of this method of instruction, i.e.,it is not possible to cover the material that the student will require, nor to cover it accurately. The student may be largely passive and participate minimally in learning by this method of instruction. There is a serious danger that lectures may be substituted for the responsibility for the student to learn on his own from many sources. The student may want the comfort of survey lectures but he may need the challenge of learning on his own. The question will always remain, and importantly: how many lectures should be given and for what purpose?

The lecture-demonstration can be used readily for whole class exercises to challenge the student to think, if the problem approach is used by having the student participate in the subject that is presented. This implies that the student has done work on the subject. The involvement of student is, then, the key to having him take responsibility. The use of the Socratic method with a class size of 450 is well described in Appendix D (32). It is obvious that students would be required to study on their own in mastering facts obtained from many sources outside of class.

2. Laboratory Exercises. There appears to be little doubt that experiments and exercises in the laboratory have helped the student in his learning by having him participate in making his own observations. However, the number of laboratory exercises is limited by time, and the degree of responsibility for the student may be quite small. Many approaches to laboratory work are used in the School of Medicine at Western Reserve University. It is not possible to measure results of the methods but only to give impressions. It is apparent that students will participate and learn facts from laboratory exercises such as anatomic dissection, multiple known slides in pathology and fixed laboratory procedures. It is unfortunate if the student performs experiments simply by rote, doing technical procedures without thought.

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*Extensive quotations are given in Appendices C, D, E and I because of the direct application of the comments of Dr. Winslow R. Hatch to the discussion of teaching. Dr. Hatch is research coordinator in higher education, Division of Higher Education, Office of Education, Department of Health, Education and Welfare, Washington, D. C.

It appears that the learning occurs in greater depth and is associated with more understanding when the student is challenged by several approaches such as, use of the unknown in a laboratory exercise, learning by the Socratic method in the laboratory, the student designing the details of an experiment, reporting results and interpretations, taking responsibility for the whole experimental protocol. See Appendix C, page 49. Obviously, the faculty must decide what is to be obtained by the laboratory exercise.

3. Independent Study. It has been well established that students can learn on their own in the simple acquisition of facts as reviewed in Appendix E (31, 32). Teaching machines and programmed learning have provided an approach to learning facts that poses an opportunity and a challenge to education as reviewed in Appendix F and Appendix G (35, 39). Text books and problem approaches are changing radically to create an active participation between the reader and the written word (29). The use of the syllabus in many subject committees in the School of Medicine has replaced text books or other references. The faculty will need to plan the program of study for the student to guide him in reference material, to obtain or prepare materials for study.

It is quite apparent that the problem approach can be used in independent study to challenge the student in obtaining information and then in using it. It is apparent that the student needs guidance and the faculty needs to learn how the student is progressing in his knowledge and his understanding of the solving of problems.

4. Working Through Problems in Preclinical Fields During Four Years. It is believed the student can be given the responsibility to work through problems as learning exercises in the preclinical fields. These should be real and require critical thinking by the student. He will need to do it in each field to acquaint himself with the particular discipline of the subject. It is believed that facts will be remembered more completely if they are learned and immediately used in solving problems. Also the student may carry this approach with him for life; but, there is only so much time for both students and faculty. Solving problems takes time for the student to read, think and record. Developing problems takes much time by the faculty. Evaluating the students' problems and going over them in conference requires faculty time.

5. Working Through Clinical Problems During Four Years -- The Case Method. Working through clinical problems by the case method is a classic and major learning exercise for students and allows for the delegation or responsibility to the student in a high degree. The case method can be defined in its many parts and can serve as one of the finest exercises in medical education; but, the case method can be ruined as an intellectual discipline and learning process unless there is appropriate supervision by a clinical preceptor. The case method is described in Appendix H.

6. Research Project, Special Studies. The project, research, student-planned laboratory experiments, special reports, seminars, studies of literature are examples of independent study that are done on the responsibility of the student. It is hoped that these methods of approach, consulting of the literature, development of the problem, critical thinking, writing of a thesis will all contribute to the student's ability to learn on his own in the future; but, there is only so much time. Therefore, medicine cannot be learned entirely by the project method. However, study in depth becomes a tool for the student to use throughout his career.

7. Conference, Seminar, Tutorial. The conference, seminar or tutorial exercise is considered as an opportunity for the student to present or discuss his own work. Thus, the responsibility lies with the student to indicate his approach to problems and his knowledge. It is not a lecture. It is not a vague exercise in talk, but a place for real problems to be discussed by students who have given real thought to them. It is an intellectual discipline; but, there is only so much time. Accordingly, the conference probably should be limited to periods when work has been done in large measure by the student. Also, the faculty must know and prepare for such conferences as maturely as they expect the student to perform.

8. Examinations. The student will respond to the faculty's emphases on the examination as described in Section 3 above, namely, what is required of the student in the amount of information, how the information is to be used for problem solving, and how the individual student's performance is used in counseling him. The responsibility that will be taken by the student will be proportional to the faculty's emphasis on it as well described in Appendix I. The faculty must recognize that the kind of examination given will set the emphasis for the learning by the student.

9. Balancing the Teaching Methods. The above teaching methods are all used to accomplish the objectives of the faculty. Each has found a role and there is reason to believe that all productive methods of teaching will be continued and others added. There are always dangers that an easy method of instructing or informing the student may be used in excess, such as lectures replacing other exercises that challenge the student to do his own study and own thinking. The subject-committee type of teaching, for example, could deteriorate seriously into a series of survey lectures of limited quality.

It is essential that the teaching methods be balanced by mature consideration of the faculty of what the student is to learn and how he is to think and use his information. This must then be translated into terms of the student, i.e., his readiness, where he is in his learning, his needs and the time available for student and faculty. The problem approach to teaching appears to offer the challenge needed by the student in self-education. It is an approach that can pervade all the methods of teaching but it takes time and thought and ingenuity to accomplish. More responsibility will be given to students in this approach and more effective use of faculty time can be a result. The amount of whole class time may be reduced to allow more time for

independent study by the student. Selection of material is essential, however, because time becomes the key limiting factor as the amount of knowledge available to learn rises so enormously. Part of the quotation from William Henry Welch (Appendix B) is referred to again as related to the medical student:

> "Looked at from the point of view of knowledge alone, he (the student) has only a smattering. The training of his powers and methods of study are the important things. He should be put in a position to continue his own education."

Section 7. Facilities for Medical Education

The questions concerning facilities are derived from the preceding six sections in the development of a program of medical education, i.e., facilities for what? As indicated in Table 5, there will be need to consider the following:

1. Lecture-Demonstration Facilities. The lecture room of the future will probably have the following features: adequate seating capacity for 50 percent more than the maximum class size, air conditioning, adequate light control for note taking, adequate blackboard space, space for demonstration of patients, equipment for lantern slides, motion pictures, open and closed circuit television. An electrical communication system can be installed for each student's desk in the lecture room to allow immediate response to questions, recording of individual responses and visualization of the responses by the instructor. This is designed to convert the large class into a conference-type exercise employing the Socratic method with participation by the audience.

2. Laboratories. The multidiscipline laboratories of Phase 1, Phase 2A and Phase 2B have been successful. Plans are being made and further study is needed on:

(i) Number of students per laboratory unit for each phase.

(ii) Kinds of benches, equipment for each laboratory. Need for microscope space.

(iii) Needs for anatomy.

(iv) Special needs for instruments, animals, adjoining equipment.

(v) Relation to individual study units and the library.

3. Individual Study Units. Research is needed on the development of a model to serve as an individual study unit for each student in the preclinical and clinical years. This has been accomplished by Harrell at the University of Florida (41). These units might accomplish the following, as outlined further in Appendix J.

(i) Provide each student with a study unit of his own where he can work effectively and with satisfaction in learning.

(ii) Decentralize the library by providing texts, references, reprints, photocopies that could be made readily available to students.

(iii) Arrange the individual study unit so that the student could work the day or evening in study, problem solving, preparing reports. This would indicate a need for safe keeping of books, journals, files. There would be need for calculating and other equipment used in processing and reporting data. This could be available in an adjoining facility.

(iv) Devices to aid learning could be used in the individual study unit or in an adjoining room equipped for audio-visual television units.

(v) Conference rooms would be needed.

(vi) Study of preclinical subjects, clinical subjects and case studies should be possible at an individual study unit.

(vii) Hospitals might adopt modified units for use of the house staff.

4. The Library. The library of the future in a school of medicine must include many classic features of a library but develop modern methods:

(i) Information retrieval will be needed more and more to locate current references and particular subjects.

(ii) Providing reference material promptly and cheaply to students and faculty.

(iii) Decentralizing the distribution of reference material to the user.

(iv) Cooperating with national groups to obtain information promptly, probably by electronic transmission methods.

(v) Providing audio-visual and other learning devices to be used by students and shown by faculty.

5. Clinical Facilities. In the School of Medicine at Western Reserve University the student has patient contact of significant amount in each of his four years beginning with the Family Care Program and Family Clinic and extending to the use of hospital facilities for the clinical science programs of Phase 2A and Phase 2B.

The clerkships in Phase 3 require many hospital facilities. The Group Clinic and Continuity Program require special facilities in the out-patient departments of the hospitals. This problem has been studied by Harrell (41) and is quoted in part in Appendix K. Future planning for hospital facilities will need to answer questions, such as:

(i) How much emphasis in the case method will be given to the study of hospitalized patients and ambulatory patients?

(ii) How much continuity will be recommended for the student and his patient in medical school? This relates to the out-patient plans for the future. What facilities will be needed for this continuity of patient contact, i.e., a student's office facility shared with others, what laboratory facilities?

(iii) Should a Phase 3 student have an individual study unit available so that he may continue his study habits of Phases 1 and 2? Should hospitals make study units available that would be practical and useful for writing up cases and for study? What laboratory facilities should be available to students?

(iv) What will be the role of teaching on the ward services, private services and the several hospitals?

6. Teaching-Learning Devices. It appears that the future will bring the continuing use in teaching of audio-visual aids including the slide, motion picture, television, teaching machine and the special problem for solution. See Appendices F and G. In addition, the classical text, syllabus and outlines will be essential to learning. Books and problems are rapidly being revised to provide student participation in their use. (See also Appendix C). The faculty must decide the role of these devices in the several processes of education such as the following:

(i) Informing or instructing the student.

(ii) Challenging the student to learn by a problem approach.

(iii) Evaluating student performance by these devices.

Facilities for the production of such teaching devices can be centralized, in part, in cooperation with other schools, but it may be necessary to decentralize the development of many of these units to individual schools. Definitive plans must await further study.

Sections 8, 9, 10, 11. Curriculum, Evaluation of the Student, Evaluation of the Program, Revision of the Program

No attempt is made here to discuss the four next steps that appear to be in sequence in the program of medical education, namely, the development of the curriculum (8), the evaluation of student performance (9), the evaluation of the program itself (10), and the subsequent revision of the program (11).

For the Division of Research in Medical Education
Thomas Hale Ham, M.D., Director

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Appendix A

WESTERN RESERVE UNIVERSITY
School of Medicine
Division of Research in Medical Education

April 8, 1961

Research in the Careers of M.D. and Ph.D. Graduates

Current Progress. Betty M. Mawardi, Ph.D., has initiated a study of careers of M.D. and Ph.D. graduates of Western Reserve University School of Medicine and plans to make comparisons with the graduates of certain other schools that are being studied by the Association of American Medical Colleges.

Future Plans. It is proposed that studies be made as follows:

1) Types of careers will be studied in a survey of the American Medical Association records for Western Reserve University and other selected schools such as those under study by the Association of American Medical Colleges. This should answer the question, "What are the graduates doing?"

2) Certain characteristics of careers will be studied to evaluate how the graduate carries out his professional activities, his sources of satisfaction, the kinds of problems he chooses to solve, his multiple roles and interests. These data would be obtained by interview in a field study.

These observations may indicate how graduates are carrying out their careers and the attitudes about their roles in their profession and in society. A study of the sources of satisfactions and the kinds of problems that are selected by the graduates may help the school of medicine in understanding the many different careers that are chosen by graduates, the educational background needed for these diverse roles and the kinds of students that are needed. Such data would reflect the activities of men in the different kinds of practice, teaching, research and other positions.

3) Special studies will be carried out of graduates selected because of particular position in their class, unusual background, unique careers, those not in practice. A study may be made of women graduates.

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

	N	Per-cent
Physicians in Private Practice -- 1790 or 66.9%		
General Practice (000)	461	17.2
Full-time Specialty (001)	1214	45.4
Part-time Specialty (002)	115	4.3
Physicians Not in Private Practice -- 598 or 22.4%		
Intern: (003)	83	3.1
Resident: (004)	258	9.6
Other Full-time Hospital Service (005)	130	4.9
Full-time Medical School (006)	59	2.2
Medical Administration (007)	10	.4
Research (008)	18	.7
Non-Federal Public Health, Dentist, or with Industrial or Insurance Companies (009)	40	1.5
In Government Service -- 152 or 5.7%		
Full-time (1 - -)	89	3.3
Reserve (2 - -)	63	2.4
Retired - - 84 or 3.1% (00X)	84	3.1
Retired from Government Service -- 18 or .7%	18	.7
Presently Active in Medicine -- 33 or 1.2% (00Y)	33	1.2
Total	2675	100.0

Addendum

In foreign countries	21
Out from records	2
"Lost"	17

- Errata for page 32 - §

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

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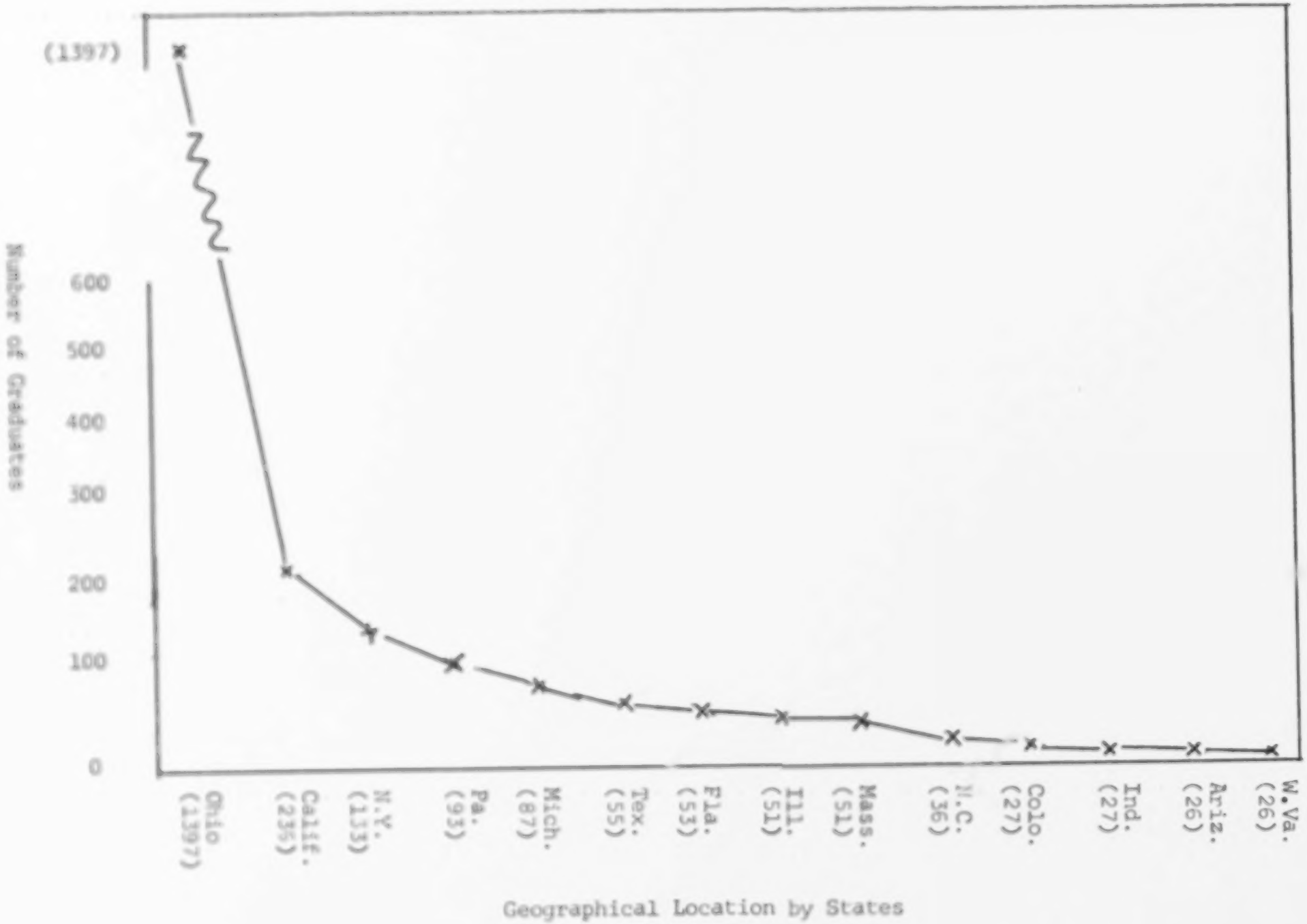
Total	2675	100.0

Addendum

In foreign countries	21
Cut from records	2
"Lost"	17

§ *Projected Needs for Facilities Based on the Methods of Teaching*. Report for 1962 of the Division of Research in Medical Education, May 1962.

GRADUATES OF W. R. U. SCHOOL OF MEDICINE
Geographical Location by States



GRADUATES OF W. R. U. SCHOOL OF MEDICINE

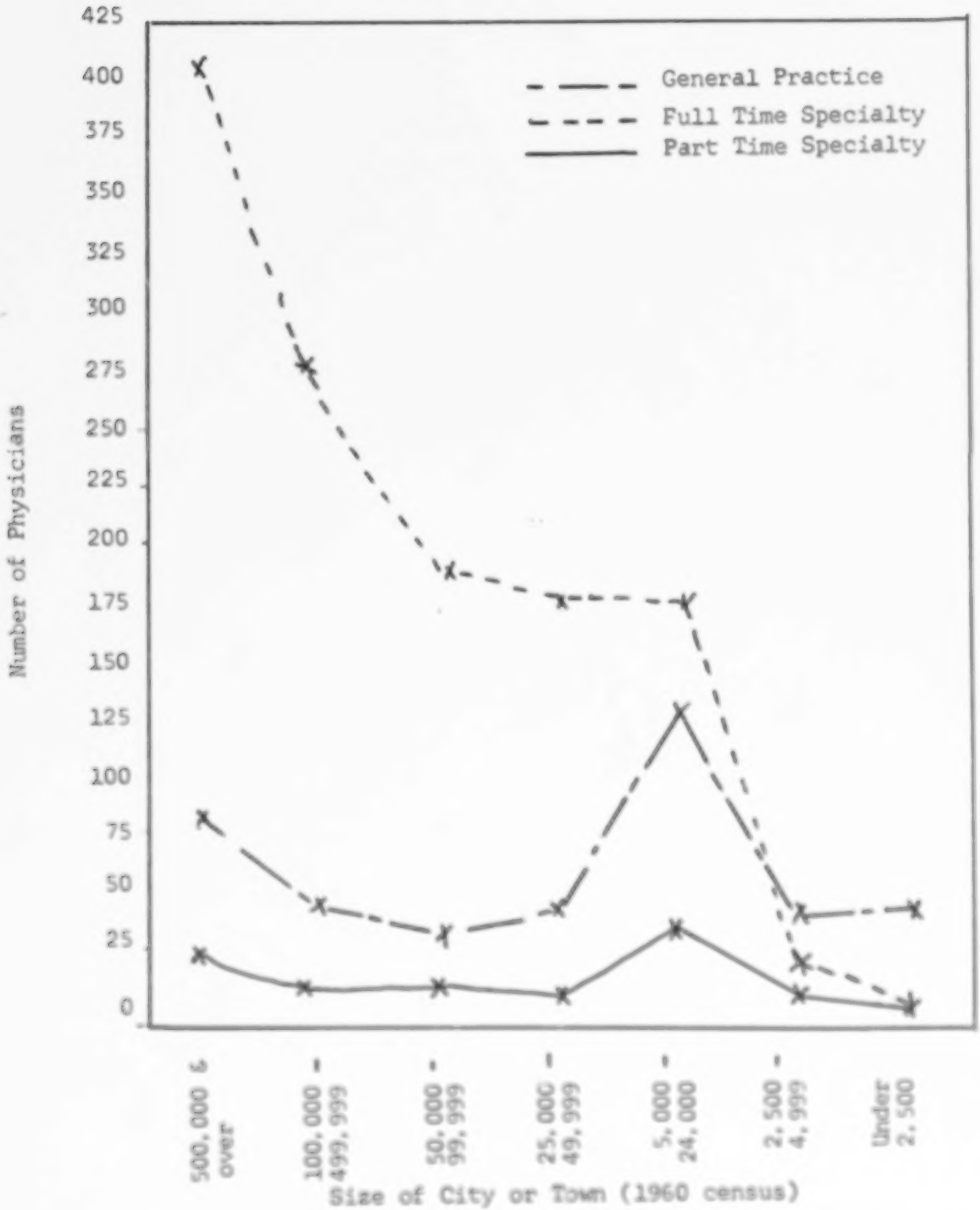
PHYSICIANS IN PRIVATE PRACTICE
(According to size of community)

Population	General Practice (000)	Full-time Specialty (001)	Part-time Specialty (002)
500,000 & over	88	405	26
100,000 - 499,999	46	265	9
50,000 - 99,999	36	190	12
25,000 - 49,999	47	152	10
5,000 - 24,999	131	153	40
2,500 - 4,999	44	23	9
Under 2,500	47	5	4
Unknown	22	21	5
Totals	461	1214	115

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

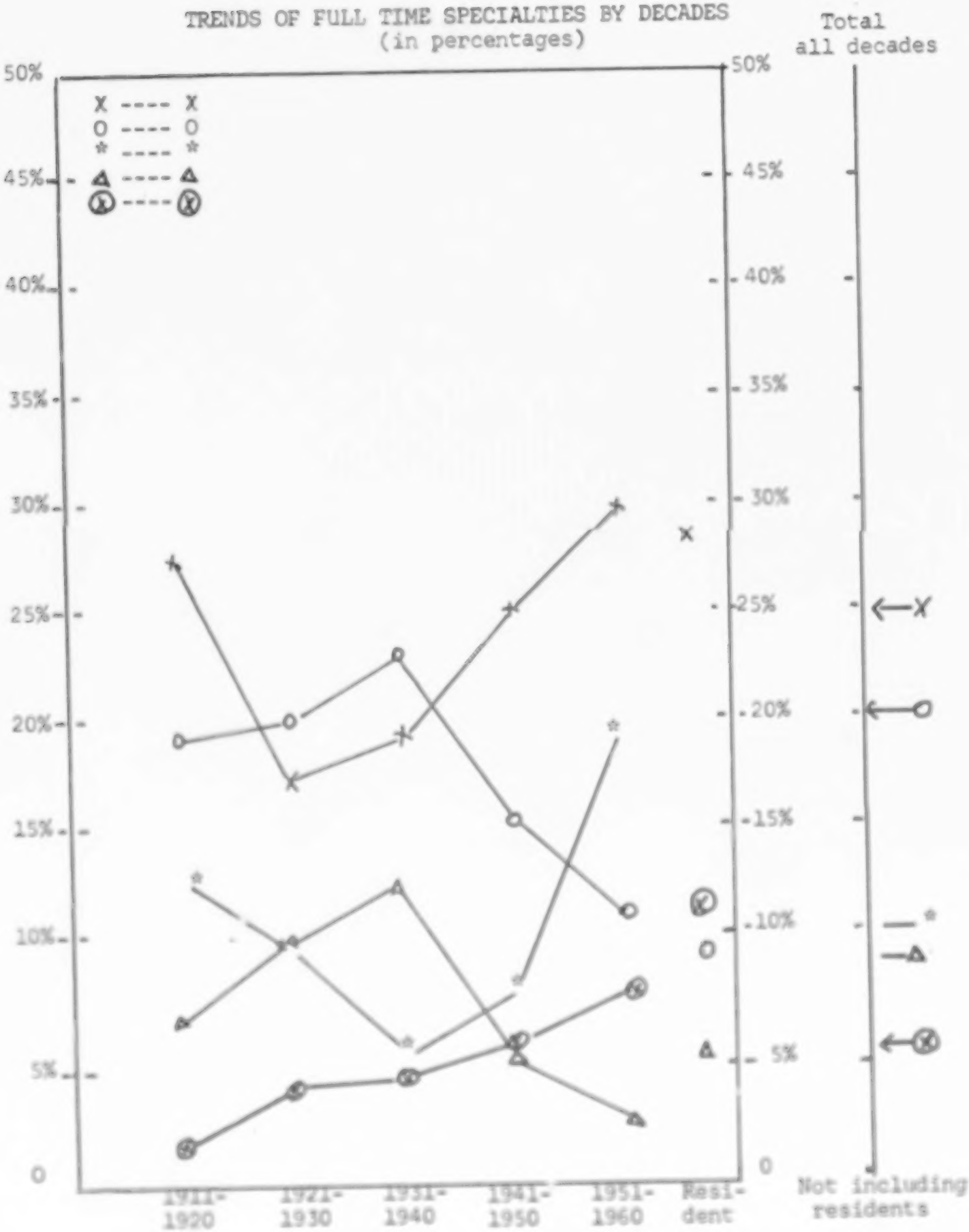
PHYSICIANS IN PRIVATE PRACTICE
(According to size of community of practice)



Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

TRENDS OF FULL TIME SPECIALTIES BY DECADES
(in percentages)

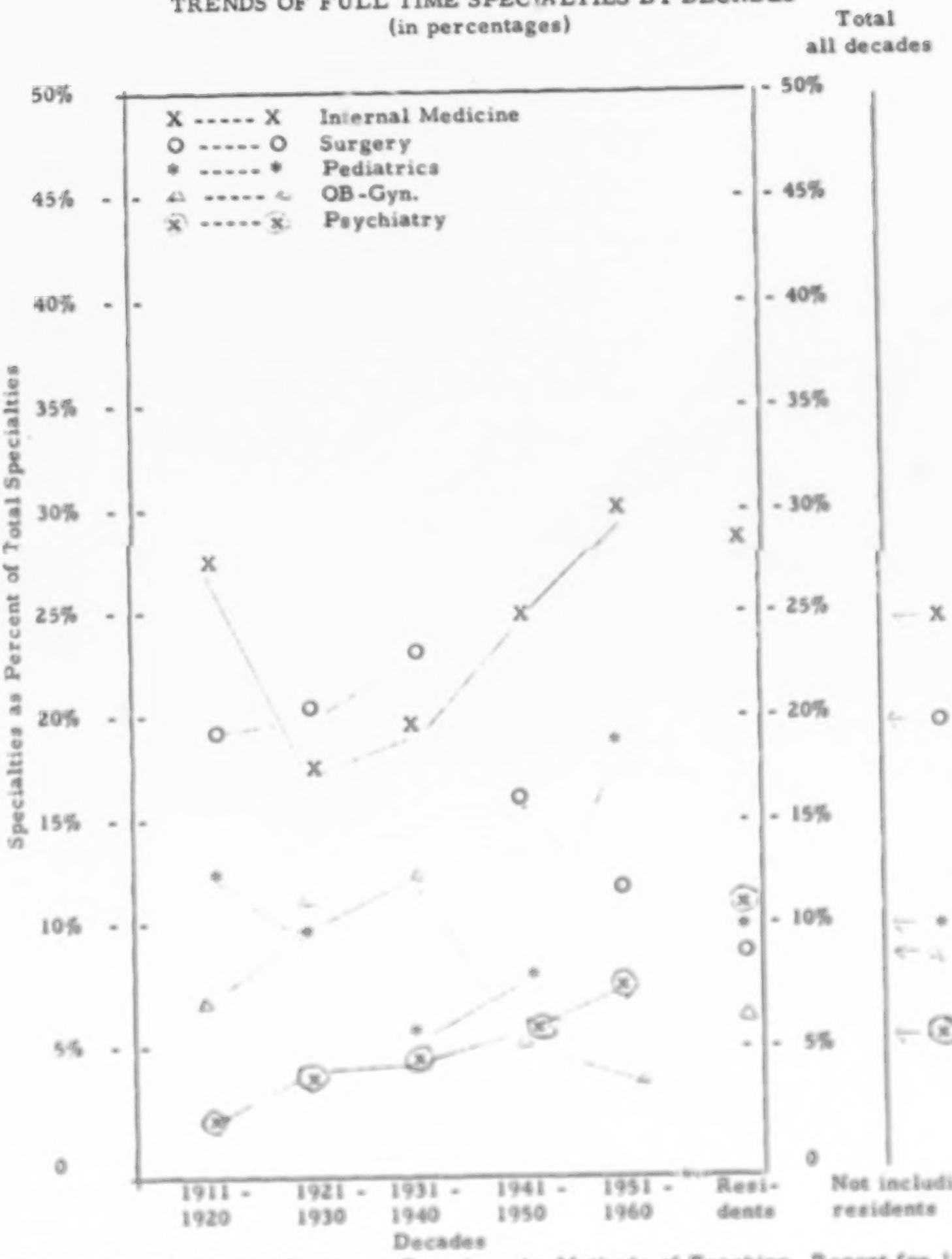


Appendix A

- Errata for page 36 - §

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

TRENDS OF FULL TIME SPECIALTIES BY DECADES
(in percentages)



§ Projected Needs for Facilities Based on the Methods of Teaching. Report for 1962 of the Division of Research in Medical Education, May 1962.

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

SPECIALISTS IN PRIVATE PRACTICE

Code	Specialty	Full Time Specialty	Board Certified		Part Time Specialty	Board Certified
		N	N	Per-cent	N	N
A	Allergy	9	2	22.2	2	0
C	Cardiovascular Disease	10	6	60.0	2	1
D	Dermatology	24	6	25.0	0	0
G	Gynecology	0	0	--	1	0
I	Internal Medicine	291	145	49.8	0	0
N	Neurology	3	2	66.7	0	0
P	Psychiatry	64	35	54.7	10	2
R	Roentgenology-Radiology	49	45	91.8	0	0
S	Surgery (General)	234	129(5d)*	55.1	39	1
U	Urology	41	29	70.7	1	0
CP	Clinical Pathology	2	1	50 0	0	0
GE	Gastroenterology	1	1	100.0	1	0
NS	Neurological Surgery	12	11	92.5	0	0
OB	Obstetrics	7	1	14.3	9	0
OM	Occupational Medicine	2	0	0.0	6	0
OR	Orthopedic Surgery	43	33	53.5	1	0
PD	Pediatrics	120	89	74.2	11	0
PL	Plastic Surgery	6	4(1d)	66.7	0	0
PM	Physical Medicine	1	0	0.0	0	0
PN	Psychiatry-Neurology	8	5	63.3	0	0
PR	Proctology	7	4(1d)	57.1	2	0
TS	Thoracic Surgery	8	6(3d)	75.0	0	0

Appendix A

Specialists in Private Practice

Code	Specialty	Full Time Specialty N	Board Certified N	Board Certified Per-cent	Part Time Specialty N	Board Certified N
LR	Ophthalmology-Otology-Laryngology-Rhinology	54	39(1d)	72.2	2	0
BC	Obstetrics-Gynecology	115	80	69.6	12	1
FH	Ophthalmology	55	48	87.3	0	0
UL	Pulmonary Disease	4	1	25.0	5	0
ES	Anesthesiology	34	25	73.5	10	0
TH	Pathology	9	7	77.8	1	1
AD	Administration	1	0	0.0	0	0
TOTAL		1214	754	62.1	115	6
					Per-cent	5.2

*d indicates certification by more than one specialty board.

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

Physicians Holding Appointments in Medical Schools of Assistant Professor or Above

Physicians in Private Practice -- 126 or 59.4%	
General Practice (000)	2
Full-Time Specialty (001)	122
Part-Time Specialty (002)	2
Physicians Not in Private Practice -- 79 or 37.3%	
Full-Time Hospital Service (005)	28
Full-Time Medical School (006)	45
Medical Administraction (007)	1
Research (008)	2
Non-Federal Public Health. Dentist or with Industrial or Insurance Companies (009)	3
In Government Service -- 7 or 3.3%	
Full-Time Veterans' Administration Hospital Service (155)	7
Total	212

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

Physicians Holding Appointments in Medical Schools of Assistant Professor or Above

		Total
Physicians in Private Practice -- 126 or 59.4%		
General Practice (000)		2
Full-Time Specialty (001) (111 Board certified)		122
Allergy	1	
Cardiovascular Disease	2	
Dermatology	6	
Internal Medicine	20	
Psychiatry	6	
Roentgenology-Radiology	11	
Surgery (General)	19	
Urology	7	
Gastroenterology	1	
Neurological Surgery	3	
Obstetrics	1	
Orthopedic Surgery	6	
Pediatrics	11	
Public Health	1	
Psychiatry-Neurology	1	
Otology-Laryngology-Rhinology	1	
Obstetrics-Gynecology	10	
Ophthalmology	9	
Pulmonary Disease	1	
Anesthesiology	3	
Ophthalmology-Otology-Laryngology Rhinology	1	
Thoracic Surgery	1	
Part-Time Specialty (002) (2 Board certified)		2
Psychiatry	2	

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

Physicians Holding Appointments in Medical Schools of Assistant Professor or Above

		Total
Physicians Not in Private Practice -- 79 or 37.7%		
Full-Time Hospital Service (005) (26 Board certified)		29
Cardiovascular Disease	1	
Internal Medicine	6	
Psychiatry	2	
Roentgenology-Radiology	2	
Surgery (General)	3	
Pediatrics	1	
Public Health	1	
Thoracic Surgery	2	
Ophthalmology	1	
Pulmonary Disease	2	
Anesthesiology	1	
Pathology	0	
Full-Time Medical School (006) (22 Board certified)		45
Cardiovascular Disease	1	
Dermatology	1	
Internal Medicine	11	
Roentgenology-Radiology	1	
Surgery (General)	1	
Pediatrics	1	
Public Health	1	
Physical Medicine	1	
Thoracic Surgery	1	
Obstetrics-Gynecology	1	
Ophthalmology	1	
Anesthesiology	3	
Pathology	3	
Medical Administration (007) (1 Board certified)		1
Neurology	1	
Research (008)		2
Non-Federal Public Health, Dentist or with Industrial or Insurance Companies (009) (2 Board certified)		3
Psychiatry	1	
Occupational Medicine	2	

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

Physicians Holding Appointments in Medical Schools of Assistant Professor or Above

	Total
In Government Service -- 7 or 3.3%	
Full-Time Veterans' Administration Hospital Service (155)	7
(6 Board certified)	
Cardiovascular Disease	1
Internal Medicine	2
Gastroenterology	2
Pulmonary Disease	1
Pathology	1

Summary:

Graduates with professorial appointments	212
Specialty designated (no specialty designated. 22)	190
Board certified (not certified by American Boards. 42)	170

Appendix A

GRADUATES OF W. R. U. SCHOOL OF MEDICINE

RECENT GRADUATES

Residents (004) (Classes of 1956-1960)

Resident Specialty	'56	'57	'58	'59	Number Residents	Percent of Total Residents	
Internal Medicine	7	12	16	18	53	28.5	
Pediatrics	8	2	5	8	23	12.4	52.7
Psychiatry	1	6	7	8	22	11.8	
Surgery (General)	5	2	4	5	16	8.6	
Pathology	1	7	2	5	15	8.1	
Obstetrics-Gynecology	2	4	2	5	13	7.0	
Roentgenology-Radiology	3	3	4	2	12	6.5	
Ophthalmology	1	6	3		10	5.4	
Ophthalmology-Otology-Laryngology-Rhinology		3		1	4	2.1	
Neurology	2	1	1		4	2.1	
Urology	1		2		3	1.6	
Anesthesiology		1		1	2	1.1	
Orthopedic Surgery			1	1	2	1.1	
Dermatology	1	1			2	1.1	
Neurological Surgery			1		1	.5	
None			1	3	4	2.1	
				TOTAL	186	100.0	

No member of the Class of 1960 was listed in the resident category (004) as of June 1, 1961.

Appendix A

WOMEN GRADUATES OF W. R. U. SCHOOL OF MEDICINE

	N	Per-cent
Physicians in Private Practice -- 76 or 49.1%		
General Practice (000)	21	13.3
Full-Time Specialty (001)	45	28.5
Part-Time Specialty (002)	10	6.3
Physicians Not in Private Practice -- 62 or 39.2%		
Intern (003)	7	4.4
Resident (004)	22	13.9
Other Full-Time Hospital Service (005)	16	10.1
Full-Time Medical School (006)	7	4.4
Research (007)	2	1.3
Non-Federal Public Health, Dentist or with Industrial or Insurance Companies (009)	8	5.1
In Government Service -- 1 or .6%		
Full-Time (1--)	1	.6
Retired -- 4 or 2.5% (00X)	4	2.5
Not Presently Active in Medicine -- 15 or 9.5% (00Y)	15	9.5
Total	158	99.9

Appendix B

WESTERN RESERVE UNIVERSITY
School of Medicine
General Faculty
Committee on Medical Education

April 10, 1951

Objectives Concerning Curriculum*

In serving the General Faculty, the Committee on Medical Education wishes to submit, at regular intervals, recommendations and subjects for consideration and debate by the General Faculty. Currently, the Committee recommends the appointment of three subcommittees to initiate the planning of detailed programs of three proposed phases of the curriculum, which are outlined below. Since the planning of these programs will require a considerable time, it will be possible for the General Faculty to review a variety of subjects related to the program of medical education and to instruct the subcommittees during their period of planning.

The following objectives concerning the curriculum have been derived from reports of the Departments of the School of Medicine, and from other programs of education and medicine. They are in draft form, are brief, limited to broad aspects of curriculum and do not include many other important and related subjects. However, it is recommended that these principles be accepted as preliminary guides for the subcommittees, but with the understanding that revision will be continued in the future by the Committee and as directed by the General Faculty.

General Objectives Concerning a Curriculum of Medical Education. The fundamental object of medical education is to make good doctors. The medical school curriculum permits the student to prepare himself for a profession in which the various members are responsible for the care of the patient, for prevention of illness, for teaching and research. The curriculum is only a means of obtaining such objectives, will require continuing charge, will never be final and is only a part of the total program of medical education, namely, the course of study. As stated by Welch:**

"It is impossible to impart the entire content of medical and surgical science to the student. One cannot even impart the content of a single subject of the curriculum.. The utmost to be expected is to give to the student a fair knowledge of the principles of the fundamental subjects of medicine, and a power to use the instruments and methods of his profession; to give him the right attitude toward his patients and his fellow-members in the profession; and above all to put him in a position to carry on the education which he has only begun in the medical school. Our aim, therefore, should be to put him in a situation to complete his education through the remainder of his life. With that point of view in mind, we cannot hope, therefore, to teach the student the entire contents of the science of medicine. The student cannot go out a trained practioner, a trained pathologist,

*Draft #11, revised by the Committee on Medical Education on April 10, 1951, and submitted to the Subcommittees on Curriculum for Phases 1, 2 and 3.

**William Henry Welch, "The Medical Curriculum," 1910.

a trained anatomist, or a surgeon. Looked at from the point of view of knowledge alone, he has only a smattering. The training of his powers and methods of study are the important things. He should be put in a position to continue his own education."

The physician requires knowledge and understanding of the patient's problems which may be related to disease, and to the patient as a person and as a member of society. Also, the physician remains an investigator for life and, by distinguishing between fact and theory, he is judging information by a scientific method of thought.

In addition, certain other broad objectives are recommended for the program of medical education, such as:

(1) The content of the curriculum be selected for its importance and organized in a sequential and coordinated manner. The student have continuing and correlated teaching through his whole course concerning biology, the principles of medicine and the care of the patient.

(2) Since complete coverage of medical information is impossible, selection of the content of a program be a continuing process, requiring emphasis on basic principles, methods and scientific evaluation of data. When the content of a program has been selected, then the teaching methods and organization be selected to fit the program.

(3) The process of teaching be done as a cooperative venture of faculty persons, who represent a variety of interests and departments and are organized as teaching groups to carry out a particular portion of the program. It is anticipated that these cooperative teaching groups will contribute to the continued education of the members of the faculty, to interdepartmental communication and to the student by offering multiple disciplines and by integration and coordination of subjects.

(4) It is essential that adequate numbers and replacements of the faculty be trained and provided, that the environment of the faculty permits continuing growth in research, teaching and education. Also, it emphasizes that effective teaching be recognized and rewarded, be considered in selection and promotion and that guidance be given to inexperienced or ineffective teachers.

(5) It is essential that the MD-student be treated as a maturing individual, as a colleague and as a student in a graduate professional school who is given increasing responsibility for his own education, for a knowledge of medicine and for the care of patients. This requires a mature system for examination and grading of the student and encouragement of the student's initiative and resourcefulness. For example, in each year the MD-student be given time for elective studies or courses and for conduct of unassigned work on the initiative of the student in such activities as organization and digestion of information, reading and interpretation of literature, preparation of reports, study of problems or cases, and conduct of research. (For further details see Phases 1, 2, 3).

(6) There be longer contact between the student and his instructors to provide the educational and personal guidance of a graduate school and the advantages of preceptorship.

Planning for the Immediate Future. Based on the general objectives of the preceding paragraph, it is recommended that the following series of working hypotheses or plans be developed further and tested by trial on a small scale, whenever practicable, and, then, on a full scale.

(1) The curriculum be divided arbitrarily as outlined below into three phases for convenience and to indicate changing emphasis rather than a break in the teaching program. The chairmen of subcommittees of the three phases report on the possible content of each phase after preliminary exploration with the Council, the Committee and members of their subcommittees and others.

(2) The composition of teaching groups be explored in relation to the content of each phase of the curriculum.

(3) Facilities be planned and tried that would permit the student, during his whole medical course, to conduct laboratory work, research and study. Such a unit be designed for effective teaching of sections of students.

(4) Facilities and a program be planned to permit student participation in exemplary methods in the care of hospitalized, ambulatory and domiciliary patients in collaboration with other health agencies. Students to follow selected patient or families over an extended period of time, under guidance and employing "office" facilities for ambulatory patients.

(5) Teaching manuals be prepared for the different phases.

Phase 1. During approximately six months to one year, depending on the content, it is recommended that the student obtain a basic education in the fundamental principles concerning the following biologic aspect of man: structure, function, growth, behavior, and effect of the environment. It is believed that these studies will serve as a basis for understanding medicine of the present, discoveries of the future, and as an introduction of the student to the patient as a person and as a member of society.

Initially, the student may be introduced during a brief period, to the whole, human organism as a structural, functional and social unit. This would orient the student to the multiple aspects of his future studies and could emphasize the need for orderly and logical progression in his education in the field of medicine.

In a period of approximately one-third of a year, the properties of living systems might be studied, not as a survey, but as a basic discipline with particular emphasis on such subjects as cytology, microbiology, biochemistry, physiology, radiology, and pharmacology. During this period, the structure, function and chemical basis of normal living systems could be emphasized with the introduction of topics dealing with certain abnormalities such as inflammation, neoplasia and other changes.

During the balance of the year (or as part of Phase 2), there could be a systematic study of tissues, organs, organ systems, metabolic systems, or other convenient units which would permit the faculty and students to integrate the major principles of structure, and normal and abnormal function.

Beginning the first year, selected patients may be shown as examples of biologic processes, the object being to orient the student, but avoid confusing him with too much clinical data in this Phase. The student would be introduced to behavior, growth, adaptation and the personality of the patient. The student may have contact with families or patients under the direction of a physician, serving as a preceptor of a small section of students, to acquaint the student with the methods of obtaining and interpreting data concerning the patient's social, economic, and personal background, and to work with other health agencies and services.

Phase 2. During approximately one to one and a half years, depending on content, it is recommended that the student be introduced to the principles of medicine, including the mechanism, natural history, pathologic changes, methods of diagnosis, clinical manifestations, prevention, and principles of treatment of disease. The objectives of this period include the re-application of material learned in Phase 1, to produce a natural transition to Phase 3, in which there is a larger emphasis on care of the patient. Phase 2, therefore, represents the principles of medicine related to the processes of disease and to the problems ofthe patient.

It is anticipated that there would be study of tissues, and organ systems, together with the symptoms, signs and diagnostic methods in relation to structural and functional changes induced by disease. There would be study of diseases themselves. Patients would be studied to serve as examples of the several aspects of disease. In addition, students would be given increasing responsibility in diagnostic methods, including the collection of information from the history, physical examination, laboratory examination, and from the patient as a member of society. The study of behavior, growth, and development begun in Phase 1, would be continued with emphasis upon abnormal behavior.

Phase 3. It is recommended that during one and a half to two years, the student apply the material of Phases 1 and 2 in the care of patients, and that his education be continued in the biology and principles of medicine. In this Phase, the student would care for hospitalized, ambulatory, and domiciliary patients. It is emphasized that the student be given responsibility, under guidance, for the complete handling of the patient.

It is recommended that the student be free from exercises requiring attendance of the whole class, so that he may participate with responsibility in the care of patients, in study, laboratory work and special or elective activities within or outside the School or University.

The Literature on Class Size; Its Implications*

This subject is discussed in a recent study "Quality and the College." pp. 176-181 (1) from which we quote:

"If teaching is more than imparting information, as it would clearly appear to be, teaching must be more than 'telling' and 'showing'. The premise developed here is that large classes, like small ones, should be taught and not instructed.

"Before discussing the actual mechanics of teaching large classes, something should be said about their instruction. In instructing (or informing) large (or small) classes, it would seem eminently desirable to assemble a proper library. This would presumably include text and reference books and both primary and secondary sources should be represented. Assignments may be made or the students may simply be given the run of the library. What is done, will depend upon what is practicable and how addicted to 'spoon feeding' the instructor is. Taped and televised lectures can also be assembled, as can programmed learning materials and pictures, still or moving. Were this done systematically, as Land (2) has suggested, the student could acquire more facts than any professor could cram into his lectures and, with the several sources available to him, the student's information might be better than one good lecturer could provide. Once provision is made for instruction, the faculty and administration can determine how many large classes need to be taught.

"The Mechanics of Teaching Large Classes:

"If a large class is to be taught, there is, in the research just discussed, and in teaching practice, some suggestions as to how such a course should be handled. These suggestions are:

"For the Large Lecture

"a. That such lectures are well taught when the lecturer rises above 'telling' and 'showing'; that the quality of his lecturing, in a word, will be manifested in the quality of his thinking and in the quality of the thinking done by his students as a consequence of his lecturing.

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*Winslow R. Hatch, "Science of Teaching." Working Draft (November 15, 1961), pp. 62-67, Office of Education, U.S. Department of Health, Education and Welfare, Washington, D. C.

(1) New Dimensions in Higher Education, No. 11, 1961.

(2) E. W. Land, Ninth Annual Arthur Dehon Little Memorial Lecture, Massachusetts Institute of Technology, Cambridge, Mass. May 22, 1957.

"b. That despite the numbers involved, the lecturer may find a conference approach practicable and more satisfactory than he might guess. It cannot be a full and free discussion, but by making his lecture a joint inquiry -- a combination of a problem-oriented approach and independent study -- he can, in a one-sided conference, involve his students in ways impossible to the expository lecturer. While only a few students are able to actually respond, the rest are involved vicariously. Such lecture-conferences are not hypothetical. They have been used, and used successfully.

"c. That such a lecture should be used to ask questions, to identify and analyze problems, and to determine what facts are relevant. Facts, however, will not normally be taught. It is also used to give direction to the students' acquisition of fact and it can be used to 'spark' and 'fan' student's interest in the inquiry being made. Inquiry or independent study does not have to be withheld from students in large classes. Actually, such classes can be used as opportunities for introducing large numbers of students to effective learning, made possible in part by their own efforts.

"d. That the medium employed (direct confrontment, T.V., Kinescope, tapes, or movies) be settled upon only after it has been decided whether the lecturer shall <u>instruct</u> or <u>teach</u> and how he shall teach.

<u>"For the Conference in the Large Class:</u>

"Even though the lecture is a type of conference, small conferences are desirable perhaps essential. As a matter of fact, the conference has proven to be the most valuable of all class meetings when used in conjunction with large lectures. In traditional lectures, as McKeachie points out, their size may have an unfortunate effect upon the student's learning because it is difficult in such large meetings to pursue those inquiries that are essential if students are to use the intellectual skills required in problem-solving. What the size of conferences should be depends upon the objectives of the teacher. If it seems essential to him that each student should make a substantial contribution at each meeting, conferences of 6 or 7 are indicated. If all that is required in the teacher's thinking is that each student make a contribution, this can be done in conferences of up to 20 students. There are, however, those that have been impressed with the fact that many of the advantages of conferences can be realized vicariously, that learning occurs even when one is unable to participate. Successful conferences of forty-five or even more, have been reported.

<u>"For the Large Laboratory:</u>

"The research done to date, and of late, indicates that the laboratory is a better learning experience than the demonstration <u>if</u> the laboratory provides students with an opportunity actually to experiment. This follows because in such laboratories, the student must do a lot of thinking as well as manipulating. In sum, the student is involved and learns by using something more than his eyesight."

The implications in the paragraphs quoted above are:

1. That provision should be made in large classes, as in small, for methods that involve students. An inclusive or generic term used to describe this teaching is student inquiry. Such teaching is to be manifested in problem-oriented, Socratic, case, and like methods.

2. That as regards the use of television, some prior questions have to be disposed of before it is decided to use, or not to use, the medium. They are:

a. To the extent that the class meeting is to inform, to what extent should the book, the movie, the teaching machine, and television be employed?

b. To the extent that the intention is to teach, to what extent can the above, (a) be used in lieu of actual confrontation by an institution's best teachers? To what extent is it essential that such teachers be employed?

c. To the extent that these teachers are employed, how can television and the above aids be best used to protect the time of the teacher?

d. How can the teacher -- and he has to be a teacher in the sense used here -- be best employed? The answer for those who have asked it, is student inquiry.

The above analysis suggests how the hard-worked phrase "television makes good teaching and good teachers go farther" can be given greater depth and a new dimension. The good teacher who reaches more students may well appear on a television screen, but it is just as essential, if not more so, that the time of such teachers should be protected so thatthey can meet students in classes in which face-to-face confrontations are achieved. This means that they should not give live television lectures.

Appendix D

The Literature on Socratic Method; Its Implications*

The most elaborate test of the hypotheses developed in the preceding pages is one in which as many as 450 students were involved. This was a course offered twice a year for ten years. It was an introductory course. While its students were primarily freshmen and sophomores, there was a sprinkling of juniors and seniors in it. These students were typical or average because the student body from which they were drawn was "unselected." The institution in question was a land-grant college which at the time had an enrollment of 4000 students or less. A Socratic method was used in every meeting of the course -- lecture, laboratory, and conference. The examinations sought valiantly to test the student's ability to think and particularly his ability to generalize or integrate. It was not an experiment in the sense that elaborate controls were set up or that its achievements were evaluated objectively. That it experienced some success seems clear, but the reader should know precisely what these successes were so that he can evaluate them as he chooses. Indications of its success are as follows:

i. The course quadrupled in its enrollment, even though it failed as large a percentage as any other introductory course in the natural sciences.

ii. The students spontaneously, and without the staff's knowledge, organized their own study group in virtually all dormitories, fraternities, and sororities. These groups were characteristically led by upper classmen who had recommended the course to underclassmen.

iii. The course was regularly audited by Ph.D. candidates.

iv. Its students organized the only intellectually oriented student activity -- a discussion group -- on the campus.

v. Of 70 students in an English course who were asked to write about an intellectual experience they had had on the campus, only 8 reported having had such an experience in a class, and 7 of the 8 described their experience in this course.

vi. Although it was a course for non-majors, it proved a good source of majors.

vii While supported originally by a very small minority (2 or 3 out of a faculty of 20), a substantial majority urged that it be made the required elementary course forthe division.

As a check on the hypotheses developed in this paper, the course has the advantage that its teachers knew very little about learning theory and their experiment was begun 15 years before the Seminar

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*Winslow R. Hatch. "Science of Teaching." Working Draft (November 15, 1961), pp. 48-49, Office of Education U. S. Department of Health, Education, and Welfare, Washington, D. C.

the Pennsylvania State University was held. In its isolation in time and place, it is, then, an independent check. It should, however, be taken into account that the teacher of the course is the author of this paper.

In the course described above, the faculty had never heard of "independent study" or "reinforcement." They were trying for just two things-- to see how much informing students could do, and how they might best be induced to think -- not now and again, but regularly, and to an effect that would be obvious and satisfying to them.

Appendix E

Acquisition of Facts*

In research done on teaching effectiveness at the University of Michigan (1), it was discovered that as regards the simple acquisition of facts, students do as well, if not better, without the personal intercession of teachers than with it; that teachers may even distract students in this instance. Students studying by correspondence master content at least as well, and perhaps a little better, than resident students. It has also been reported that when certain English classes (2) were reduced from 5 to 3 hours a week, and when certain social science classes were treated in the same manner, the average achievements of the students were at least as high under the new as under the old arrangement. In another experiment (2), seven ten-minute conferences resulted in better student achievement than did group class work. The results of independent study programs, in general, indicate that students in these programs learn at least as much as those engaged in regular class work (3).

Pfnister (2) concludes that "If we are willing to agree that the proper criterion of student achievement is commend of a certain content, contact hours between student and instructor may be slashed drastically without any apparently bad effect upon the amount of learning." The implications of this research for teachers, and paritcularly for the teachers of large classes, are very clear. If they are not teaching, they are vulnerable and expendable. Neither they nor the college can afford to instruct large (or small) classes, that is to say, to simply provide information. They must teach them. While teaching and instructing are always mixed, the more one teaches and the less one instructs, the better it is likely to be for both the teacher and the taught. As a matter of fact, if teaching were the imparting of knowledge, there would be no large class (or small class) problem. Instructors are not hard to come by -- they only have to read ahead in the textbook -- but even if they were, the problem would still be manageable, because books, teaching machines, teaching tapes and television sets can be mass-produced.

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*Winslow R. Hatch, "Science of Teaching" Working Draft (November 15, 1961), pp. 60-61, Office of Education, U. S. Department of Health, Education and Welfare, Washington, D. C.

1. "Effects of Varying Degrees of Student Interaction and Student-Teacher Contact in College Courses," By Thomas S. Parsons, Warren A. Ketcham, University of Michigan; and Leslie R. Beach, Whitworth College, 1958, Instructional Research Program, Project 2, School of Education.

2. "Review of Research on Class Size," by Allan O. Pfnister, The Annual Conference on Higher Education, University of Michigan, November 17, 18, 1959, pp. 17-26.

3. Winslow R. Hatch, "Independent Study," No. 1, New Dimensions in Higher Education, 1960, pp. 31-34.

Appendix F

Teaching by Machine*

p. 145. The teaching machine seems to be a major breakthrough in education comparable to the book, radio, and television. Its potentiality needs to be explored and efficient and effective means devised for making it available. It can maintain the optimum conditions of communication and control considered essential in modern learning theory. Although mass media communicate effectively, they do not control; they are "open loop" systems. This means that for rapid modification of the learner's behavior systems they lack the critical feedback ingredient. The teaching machine, on the other hand, is a closed loop system which does provide feedback.

p.147. Teaching machines are not devices for eliminating the teacher (e.g., Barlow, 1960); rather they are a way of implementing his instruction and of multiplying its effectiveness. They take some of the drudgery out of the teacher's job; for while the teacher is still the responsible planner of the learner's instruction, he is no longer tied to the specific detail of instruction and drill. This routine aspect of the job can now be carried out by machine. The machine, in this way, allows the human teacher to plan and determine individual needs (e.g., Blyth, 1959c; Skinner, 1954; Stolurow, 1960 a and d). He can develop new and more efficient methods of instruction and can keep the content of the course up to date. He can plan programs to meet individual needs and spend more time getting to know his students and his subject matter.

p.148. When the student is alone in front of a machine-tutor he is equipped with controls that permit him to see animated films and other aids which should contribute to his learning. In such an ideal situation, he is completely on his own and can pace the material at whatever rate he chooses. In this situation, as in the classroom of the future, he is constantly required to respond to questions. The machine is prepared to take a principle and go over it from time to time, with altered presentation and additional detail, as required, and even possibly to switch to alternative methods of presentation, all available in its library upon request. Ramo envisions all of this to be backed up by a whole new industry.

p.149. If machines are widely used, the student may learn to study by himself and to play and work with others, thus an important separation will be achieved. After all, what symphony was written by a group? What scientific theory was the product of a group? While groups have a very important place and students need to learn to get along with others, one might ask whether this should be done in the same setting as the learning of mathematics, chemistry, etc. Might it not be better for the student to study alone and to use what he has learned in a group setting?

Appendix G

Teaching Machines and Programmed Learning*

p. 572. The Future. Teaching machines and programmed learning can have a major impact on education. Their use can effectively and dependably guide the student's learning-by-doing as he proceeds, as rapidly as his abilities permit, through carefully pretested instructional programs. It can thus be made economically feasible to provide every student with many of the benefits of a skilled private tutor, since auto-instructional materials can anticipate and be responsive to his needs for mastering each aspect of a subject matter. Not only do programmed materials themselves thus havethe potential for producing much more efficient learning than has hitherto been generally possible, but their wise use should make possible the much more constructive use of the teacher's talents.

The basis for consistent improvement in educational methods is a systematictranslation of the techniques and findings of the experimental science of human learning into the practical development of an instructional technology. To achieve the full benefits inherent in this concept, instructional materials and practices must be designed with careful attention to the attainment of explicitly stated, behaviorally-defined educational goals. Programmed learning sequences must be developed through procedures that include systematic tryout and progressive revision based on analysis of student behavior.

The rate at which the methods of programmed learning may influence the practices, staff, and facility requirements of school systems is difficult to predict. However, it seems likely that we can look forward to significant revisions in concepts of classroom practices and teacher functions. We also need to foresee and plan for the time when, because of increased instructional effectiveness, a much more advanced range of educational content can be included in the precollege curriculum.

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*A. A. Lumsdaine and Robert Glaser, "Teaching Machines and Programmed Learning," National Education Association, Washington, D. C., May 1961, p. 572.

Appendix H

WESTERN RESERVE UNIVERSITY
School of Medicine
Division of Research in Medical Education

March 12, 1962

The Case Method of Education and the Patient*

I. PREMISES. It is apparent that the student will follow the lead of the faculty with responsibility and effectiveness if two questions are answered for him, namely,

1. What does the faculty believe is most important?

2. How am I doing?

The faculty finds it difficult to define what is most important because of the riches of the medical heritage. In Phase 3, for example, it is proving complex to balance the requirements of students in clinical fields with the opportunities for elective studies.

In the clinical fields it has been quite indeterminate to define the fundamental principle that could guide the faculty in solving the problems such as those of time, content, multidiscipline ward, basic clerkship, special fields such as medicine, pediatrics, surgery, obstetrics and gynecology and the several subspecialties in these fields. Fortunately, the faculty must find some simple principles as guides because the variables are enormous and they demand clarification. It is believed possible now to redefine a few principles which will be obvious and may serve the faculty as it proceeds from concept, to plan, to actual programs.

II. CONCEPTS

1. Case Method. The case method is an intellectual endeavor, a mental discipline, a problem approach and a learning experience. It has been the basis of education in medicine, law, business administration and other fields. It allows the faculty to transfer responsibility of a high order to the student. It permits multiple disciplines to be integrated in a single orderly approach.

2. Subject Material. The subject material learned in Phase 1, Phase 2 and Phase 3 can be applied in a responsible manner by the student in the case method. It is comparable to application of the knowledge of the law to the case study in law school.

3. The Patient. The case method as an approach is designed to help solve the problems of the patient, including the obtaining of data, developing a diagnosis and carrying out preventive medicine and treatment. This is a major objective of medicine.

4. Increasing Responsibility and Pace for the Student. The case method of education is introduced on Day #1 of Phase 1 and is continued with gradual increasing responsibility throughout four years.

*Submitted to the Phase 3 Committee for discussion.

5. Defining the Quality Required in the Case Method. The faculty can define in writing the quality of performance expected of the student in developing the case study of a patient. The component parts of the case method are exceedingly well known to the faculty and could be described to the student from the first, as one approach in his education, this approach being oriented to the patient.

6. Evaluation of the Student's Performance. Much progress is being made by direct observation and recording of students as they perform the many steps in the case method. It should be possible in the future to develop further the criteria of performance expected of a student at certain periods.

7. Qualifying the Student in the Case Method. It should be possible to define certain limits of performance of the student in the case method so that he may be qualified to be promoted from one degree of responsibility to another in his education and finally to the care of the patient. The more the student understands what is required of him to qualify in the case method the more he will educate himself to this goal.

III. PLAN. A practical plan must be derived from the above concepts. Some of the features of the plan are listed below.

1. The Case Method in Medicine. Much excellent thought has gone into the discipline of the case method in medicine. The student can be guided in all years, especially in Phase 3, by his preceptors as he DOES the following:

(i) History. The student learns the process of obtaining the anamnesis from the patient. This approach is the collection of information that forms the most important basis for the development of the case. He records the data.

(ii) Physical Examination. The student learns to obtain data by direct examination of the patient and to record it.

(iii) Laboratory Examination. The student learns to obtain data by laboratory examination.

(iv) Special Examinations.

(v) Preparation of a Written Summary. The student processes his data from the case to produce a summary of the information.

(vi) Review of the Subject Material. The student is required to review his memory, previous education, and the literature on the subjects that appropriate to the case. This step in the case method is fundamental to the next.

(vii) Analysis of Data to Establish a Diagnosis. The student is now required to approach the problem of the case in performing the following: critical evaluation of the limits of significance of the data obtained from the patient, correlating the data into possible explanations or diagnoses, integration of these with the known facts from the literature. Working hypotheses or diagnoses are proposed with their limitations and possible methods for establishing them or testing their validity.

(viii) Testing Hypotheses. The possible diagnoses are subject to test by systematic studies.

(ix) Application of Diagnoses to Treatment. The treatment evolves from the case method of analysis at this step as correlated with the known therapeutic procedures available.

(x) Continuity of Evaluation of the Case. Follow-up of the case requires the re-application of all of the above steps in an attempt to evaluate the true situation with the patient.

(xi) The Case Method and the Patient. Obviously the case method is an intellectual process in attempting to solve problems. Since the problems concern a patient, the student must employ the method to a person in an understanding and thoughtful manner at all times.

(xii) Presentation of the Case. The discipline of selecting and presenting the data on th case is an important one as done in writing and done verbally.

2. Learning the Case Method. It is believed that the case method can be learned by the student as a conscious approach to the problems of the patient and can be continued throughout all four years. It could serve as a continuum with the learning of subject material.

IV. POSSIBLE PROGRAMS.

1. Phase 1. The case method can be described in writing and introduced as an intellectual procedure in Phase 1 to show the student what is expected. A beginning is being made in Phase 1 in the study of a family and the reporting by the student of his case. He learns subject matter of importance to the case method in subject committee.

2. Phase 2. It is important to realize that the case method is being developed by demonstration and performance in Phase 2 to include the anamnesis, physical diagnosis, laboratory tests andthe study of one patient as a long-term project. Also, the subject committees emphasize learning information and the use of information in the

understanding of disease. M ny case studies are given by subject committees. Undoubtedly it should be possible to emphasize the complete case method throughout Phase 2 so that a high degree of readiness would occur for Phase 3.

3. Phase 3. The hope is that students in Phase 3 may have responsible experience with the case method until they qualify to a more advanced responsibility of care of the patient under guidance. This implies two steps that may aid in the dilemma of planning Phase 3.

(i) Qualifying the Case Method. It is believed that students could be expected to perform critical case studies under the guidance of preceptors to establish that they are qualified in studies of patients with problems in internal medicine, pediatrics and surgery. It is recognized that certain students will be more prompt than others in demonstrating their ability to perform the whole process with adequate skill. To qualify implies that criteria can be described for performing the case study and that direct observation can be made of the student's performance. Methods of observation are being studied now.

It might be possible for students then to be accommodated for their qualifying period for certain units of time on the three services, but with a more limited objective than the classical clerkship with its larger component of care. Preceptors could work with students in their case method as done now on several services.

Implied is the expectancy that each student would be expected to perform a designated (minimum) number of case studies in medicine, pediatrics and surgery for experience, and for demonstrating his skill. Once qualified in the case method in such subjects, the student could be available for the next step, i.e., more responsibility in care. Students may well be divided in three groups: those who qualify rapidly with a minimum number of cases, those taking somewhat longer, and those who may be held for a considerable period of time to qualify. It is considered essential that a student show his ability to perform a case study with some comfort and effectiveness before becoming a clinical clerk or going to the Group Clinic.

(ii) Care of Patients. Once qualified in the case method in the several fields, the student would be eligible for the more classic clerkships and the Group Clinic where he may meet the patient first and employs the case method with a larger emphasis on the conduct of treatment of the patient.

(iii) Knowledge of Medicine. It is understood that students will devote continuing effort in all their case studies to review and apply knowledge obtained in their subject committees and that obtained by reading on their own for which they will be held responsible. Only in this way can the content of medicine be obtained and put to use.

(iv) Electives. The electives are not discussed here, but emphasis is placed on the need for the control of excellence in the electives in the many fields of preclinical, clinical and research activities. Also, there is need for a small number of selected advisors to guide students in the many choices that face them in their Phase 3 and internship periods.

Thomas Hale Ham, M. D.

P. S The case method as described here is a discipline, a rugged exercise in thinking, an opportunity for the use of current information in a realistic problem. These analyses should set a top standard in education and be multidiscipline in content.

Appendix I

THE EXAMINATION*

The examination is important because it, more than a teacher's aspirations, determines what kind of a course is actually taught. If a course proposes to exploit good conditions of learning, the examination should be a teaching instrument and should measure the effectiveness of the learning.

If the learning is to be critical, the examination should test the student's ability in analysis or particularization and in interpretation or generalization. It ought to test for understanding. To do this, according to Tyler (lecture), one should ask students to state the principles in their own words and examine them to see if they recognize different illustrations of the principles and are able to suggest illustrations of them. One should also test the students' ability to compare and contrast the principles and to use them to explain phenomena.

Among other things, we would want the examination to help the student evaluate himself; to discover what talents he has, or lacks--in particularization, in generalization and in expression.

In a large introductory course, there is a good chance that promising students may not be identified as they should, or as soon as they should. A good examination can be used to identify students with a talent for critical or creative thought. While the examination should be designed for all students, it can be used to stretch and thus identify the better students.

If the examination is to be a teaching instrument, it should state what it proposes to teach. If the examination has subsections, these sections, too, should be introduced by topic sentences that indicate the mental operation required. A very considerable amount of teaching can be done by those simple devices. Furthermore, there are few opportunities as good as the examination for giving the students that overview which is required if they are to really understand it. If the material being examined has a structure, it should become apparent in the course of the examination. In a situation where a grade and status are involved, a little humor may not be out of place. It could thaw the freeze to which some students are prone.

If the examination is used as a teaching device, it should not be a surprise party. If the class has been thinking and talking about important things and the examination deals with important things, it will be no surprise. The problems in the examination -- and the examination should certainly deal with problems if the course is problem-oriented -- should appear in contexts that are new to the students, so that they will have to think their way through them. If, in other meetings of the course, some critical method has been used, the students should not be surprised if they are asked to employ this method in the examinations. This type of examination will also discourage cramming. If a student did not get his facts as he went along and did no thinking about them before taking the examination, his cramming will do him no good.

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*Winslow R. Hatch, "The Science of Teaching." Working Draft (November 15, 1961, pp. 44-46.)

Appendix I

When an instructor states thatit is his hope that the class will acquire an understanding of principles, a literally minded student will assume that the examinations in the course will test his understanding of them. When he discovers that all that is required is a good vocabulary, or a word in this blank, or a check in that bracket, he is likely to lose some respect for the examination and its author. An essay-type question, particularly in the sciences, is a rare experience for both teacher and student. It may be rare because the teacher just cannot stand to learn the truth. Certainly it is hard on the teacher's ego to grade an essay question, because a student often makes the right response in the first sentence, and then demonstrates in the next that he does not have the slightest idea of what he is talking about and that the material just has not been taught. For the student, it can be just as painful, but it is important for him to learn what he has failed to learn.

One of the awkward things about writing a new kind of examination is that it is not always possible to do it until one has overhauled his course and straightened out his own thinking. One has to be clear in his own mind as to what the significant ideas are before he can ask questions about them, let alone grade the answers.

Appendix J

March 16. 1962

WESTERN RESERVE UNIVERSITY
School of Medicine
Division of Research in Medical Education

Individual Study Units: An Experiment in Decentralization of the Library*

I. PREMISES

1. Student Responsibility for Learning. In the years ahead. it appears inevitable that the student will be given increasing responsibility and more time to learning on his own by the working through of problems in preclinical and clinical fields. This may allow students to proceed at their own pace.

2. Facilities in Preclinical Subjects. Two facilities will be needed for the student in his learning in the preclinical years as his own home bases:

   (i) A multidiscipline laboratory as already available in Phase 1 and used for experiments.

   (ii) An individual study unit that needs to be constructed and evaluated for its effectiveness as a place for conducting study and the solution of problems.

II. OBJECTIVES FOR INDIVIDUAL STUDY UNIT

1. General. It is proposed that a student have his own desk with enough privacy to make study possible and to equip him with library materials, learning aids, and other facilities to make problem solving convenient. This unit would be developed to make learning effective and to treat the student as a member of a graduate school who will do increasing amounts of his own education in the coming years.

2. Decentralization of the Library. The great opportunity offered by the individual study unit is decentralization of the library by the following methods:

   (i) A new central library could be equipped with pneumatic tube or other carrying device to allow rapid exchange of books and periodicals to students** who could request them by telephone or other intercommunication device.

   (ii) Selected texts or references could be placed in a small Phase 1, Phase 2A, Phase 2B, Phase 3 reading room on consignment at particular times for reference only.

   (iii) Photocopying is advancing rapidly and may help enormously in thefuture to produce reprints for students.

   (iv) Information retrieval may develop rapidly in the next ten years for students.

*Submitted for discussion.
**Students would be responsible for books received and probably would have charge plates for identification.

(v) Television or other automated devices may be installed from the central library to the individual study unit or adjoining room.

3. Research Equipment. The student will need immediate access to his microscope. He will need calculators, may use IBM and computer equipment in problem solving. These calculating devices could be in a room adjoining the individual study units. Drawing equipment and a Polaroid camera may be needed for preparation of reports.

4. Devices for Learning. In the individual study unit there may be outlets to allow the use of equipment loaned from the library, such as tapes of lectures, records, film strips or teaching machines. Adjoining could be units for audio visual presentations including television.

5. Student Opportunities and the Individual Study Unit. The student should be able to read in some comfort and with enough privacy and sound-proofing to allow effective learning. The student's individual study unit should be available most of the time. It should have locked compartments including a place for books, journals and reference materials. The microscope may be cared for elsewhere. A regular file drawer for references should be available so the student may build his own file. There should be space for devices for learning, electric outlets and wiring for future connections with a central library. Lighting should be adequate.

It is proposed that a "standard" unit be developed that would be reasonable enough in size to be placed in or near the phase laboratory for the appropriate class. It is hoped that a standard unit for learning could be developed and be available to a student in each of the four years and available to future interns and residents. It would become a necessity.

If the individual study unit is to be used, it must be effective for study, for reference work, for study of problems whether preclinical or clinical. The student could spend much of this time educating himself in a multidiscipline laboratory in the individual study unit and in the outpatient department or hospital ward.

III. EXPERIMENTAL APPROACH

1. Committee: It is proposed that a committee be organized immediately by the Committee on Medical Education, the Division of Research in Medical Education, the Office of the Dean, Student Committees on Education and expert consultants* to work with the architect or designer, or both, to:

(i) Design a mockup of an individual study unit.

(ii) Do a pilot study on its effectiveness because one cannot fail in such a program.

*Consultants should be sought from library experts from those working in information retrieval, from engineering experts, designers.

Appendix K

Medical School Facilities. Planning Considerations and Architectural Guide

U.S.Department of Health, Education, and Welfare - Public Health Service Publication No. 875. Washington, D. C., 1961 (41)

TEACHING FACILITIES

NURSING UNIT

In addition to the usual care and treatment facilities, a teaching hospital nursing unit should contain for teaching purposes: a student charting area, a student laboratory, a clinical conference and patient demonstration room (to accomodate 16 students plus the patient bed), a house officers' reports room, a consultation room, and a treatment room.

The hospital's nursing units typically are segregated according to the various major clinical specialties such as medicine, surgery, obstetrics, pedicatric, and psychiatry so as to facilitate the teaching and patient care programs conducted within the hospital. Consideration in planning should be given to need for nursing units for chronic disease, rehabilitation, clinical research, and other special services.

A nursing unit of 30 beds is generally considered an effective size for teaching as well as operating efficiency. A special chronic disease or ambulatory unit might appropriately contain a larger number of beds.

Where two like nursing units adjoin on a nursing floor, one student laboratory and one clinical conference and patient demonstration room may well serve both units, although a separate student charting area for each nursing unit is considered advisable. These basic facilities for teaching purposes may prove adequate, with careful scheduling, to meet needs of additional teaching programs such as those for student nurses. However, consideration should be given to possible need for augmenting conference facilities on nursing units where multiple teaching programs are conducted.

A house officers' reports room and a multipurpose office for use by faculty members and clinical instructors, preferably located close to or adjacent to the nursing station, are essential teaching elements on each nursing unit. It may be desirable to augment the office facilities on mixed service nursing units where two or more clinical teaching programs are conducted.

If it is assumed that the nursing units in a 500-bed and a 700-bed hospital are organized as shown in table 34, the estimated net area needed for nursing unit teaching facilities is given in table 35. These estimates are based on the assumption that where like nursing units adjoin each other, the following facilities are shared by these units: student charting area, student laboratory, patient demonstration classroom, and house officers' reports room. Consultation rooms are provided at the rate of one for every 30 beds. A treatment room is provided for each nursing unit.

Table 34 -- Organization of nursing unit teaching facilities in hypothetical 500-bed and 700-bed teaching hospitals.

Service	500-bed hospital		700-bed hospital	
	Units	Beds	Units	Beds
TOTAL.....	16	500	23	700
Medical.....	4	120	6	180
Surgical.....	5	150	7	210
Maternity.....	1	30	2	60
Pediatric.....	3	90	4	120
Psychiatric.....	2	60	2	60
Chronic or ambulant....	1	50	2	70

Table 35 -- Net area for each type of facility for nursing unit teaching facilities in hypothetical 500-bed and 700-bed teaching hospitals.

Service and type of facility	500-bed hospital		700-bed hospital	
	Number of rooms	Square feet	Number of rooms	Square feet
Total net area.....	---	13,930	---	21,640
Medical:				
Total.....	---	3,040	---	5,410
Student charting rooms.....	3	600	4	800
Patient demonstration class-rooms.....	3	1,350	4	1,800
Student laboratories.....	3	1,140	4	1,520
Consultation rooms.....	5	350	7	490
House officers' reports rooms.	3	600	4	800
Surgical:				
Total.....	---	4,110	---	5,480
Student charting rooms.....	3	600	4	800
Patient demonstration class rooms.....	3	1,350	4	1,800
Student laboratories.....	3	1,140	4	1,520
Consultation rooms.....	6	420	8	560
House officers' reports rooms.	3	600	4	800

TEACHING FACILITIES

OTHER HOSPITAL INPATIENT

Other departmental teaching facilities required in the teaching hospital include special work, examination, and conference rooms in the diagnostic X-ray department, the X-ray therapy department, the surgery department, and the obstetrical delivery department. These space requirements are described in Table 37.

Observation facilities in the surgical and obstetrical suites require careful design to be effective teaching aids. An unobstructed view of the operative field is necessary, and there should be facilities for inter-communication between the observers and the surgeons or obstetricians. Provision for closed circuit television camera and motion picture camera equipment and medical illustration activities is frequently incorporated into the design of observation facilities.

OTHER SPECIAL SPACE AND SERVICES

Other special space required includes primarily study facilities for students and house staff, and a lecture room. Space requirements for such facilities are given in Table 38.

Unless suitable study space is provided in other units of the medical school, the hospital planning should incorporate provision of a study cubicle with locker for each student assigned for clinical experience, as well as for house staff. Student lounge facilities, preferably related to the study areas, should be a planning consideration. These provisions for students would be similar in design to those for first- and second-year students in the medical school.

A sloping or stepped floor lecture room of 300 seats should be provided for clinical pathological conferences, other lecture and demonstration programs for third- and fourth-year medical students, and for other teaching hospital education programs and meetings. This auditorium is sized to accommodate 180 third- and fourth-year students and the hospital house staff. Programs will include the demonstration of patients. To provide adequate sight-line clearances for observing the patients, the demonstration area is usually constructed as a stage or raised platform andthe seating arranged in curved or canted rows on a stepped floor in the manner of an amphitheater. The raised platform requires a ramp connection with the corridor to implement moving the patients on stage. The distance between the first row of seats and the back wall of the platform is seldom greater than 20 feet, although it may be less depending on the choice of slope for the floor and other factors. This auditorium should contain slide and motion picture projection facilities, an adequate public address system, and possibly other teaching aids such as closed circuit television viewing equipment. Electrical outlets to accommodate overhead projectors or portable X-ray film illuminators, positioned in the level space between the front row of seats and the raised platform are advisable. All seats should be fixed in position. Auditorium-type seats with drop-leaf tablet arms are preferable. Other design and equipment considerations would be similar to those of the basic science lecture rooms.

Appendix K

Planning of the teaching hospital should include considerations of the additional area and service needs imposed over and above average hospital requirements, since it will be necessary to accommodate student groups in patient rooms and other ordinary clinical facilities. For example, the additional load imposed on the hospital call system in meeting student-related communication needs is substantial and may influence selection of an audio system so that announcements may be made for clinical conferences and other teaching sessions.

Table 39 gives a summary of the estimated additional space for teaching facilities in hypothetical 500-bed and 700-bed teaching hospitals. The figures in the table are for net space with no allowance for exterior walls, partitions, corridors, etc.

Table 38 -- Net area for each type of facility for other special space in hypothetical 500-bed and 700-bed teaching hospitals.

Type of facility	500-bed hospital		700-bed hospital	
	Number of units	Square feet	Number of units	Square feet
Total net area.....	---	14,960	---	19,900
Study cubicles:				
Total.....		11,660	---	16,690
Third-year medical students' study cubicles.....	60	3,010	90	4,230
Fourth-year medical students' study cubicles.....	60	3,010	90	4,230
Interns' study cubicles.....	30	1,410	45	2,120
Residents' study cubicles.....	90	4,230	130	6,110
Sloping floor lecture room (300 seats).....	1	3,300	1	3,300

Table 39 -- Summary of space estimates for hospital teaching facilities in hypothetical 500-bed and 700-bed teaching hospitals.

Type of facility	500-bed hospital	700-bed hospital
	Square feet	
Total net area.....	62,180	83,690
Nursing unit teaching facilities.....	13,930	21,640
Outpatient department.....	30,070	38,420
Other departmental teaching facilities.	3,220	3,640
Other special space.....	14,960	19,990

Appendix K

OUTPATIENT DEPARTMENT

The outpatient department of the teaching hospital is gaining increased recognition as an important teaching facility. Ambulatory care is often stressed as a particularly important element in comprehensive medical programs. Student experience in the clinics, properly correlated with curriculum, is receiving greater emphasis. In some schools the clinics continue the area of initial exposure to patient situations, starting with the first-year student and continuing through the fourth year.

The volume of outpatient visits required to support teaching programs varies with the size of the medical school and the degree to which clinical experience in the outpatient department is emphasized. For estimating purposes an average daily volume of 250-350 clinic visits may be used in planning a teaching hospital outpatient department serving a medical school with an entering class of 64 to 96 students.

Patient examination rooms will be required at the rate of approximately one for each fourth-year medical student and one for each four interns and residents (House staff). Other facilities for teaching purposes include consultation cubicles which should be located near the examination rooms at a ratio of about one to four. These consultation cubicles are used by students in discussing their patients with the clinical instructors or preceptors. They can also be used by clinical psychologists.

Clinical conference and patient demonstration rooms are essential to the clinical teaching program and, ideally, should be provided in all major clinics. These should be sized to accommodate 16 to 20 students, depending on the size and type clinic. While a general medical clinic might require a 20-seat conference facility, subspecialty clinics might have minimal conference room needs which should be provided in multidiscipline conference facilities of limited size.

Concepts of outpatient department design and operation vary greatly depending largely on prevailing local practice. Planning necessitates consideration of the various methods of handling outpatients, not only from the clinical but also the administrative standpoints. The manner in which outpatient reception, registration, and waiting facilities are designed will in part be determined by the department's clinic structure which, in turn, is dependent on factors such as the extent to which the group practice approach, or the segregated service clinic approach, or combination of both, may prevail.

Inasmuch as detailed guide material for design of teaching hospital outpatient departments is not readily available from other sources, area tabulations for some specialized elements of a department averaging 300 clinic visits daily are contained in a subsequent section of this report. This department is designed to

function with a structure of separate clinics and a diagnostic clinic in which a modified group practice approach prevails.

Table 36 gives the net area for the various facilities of the outpatient department of a 500-bed and a 700-bed teaching hospital based on the following assumptions:

(1) The department will have an outside entrance and patient waiting area apart from those of the hospital proper, with separate admission facilities for "regular" and "private" outpatients.

(2) Outpatient medical records will be stored in the medical record room of the hospital with the inpatient records except while in use.

(3) The following hospital departments will serve outpatients as well as inpatients: diagnostic X-ray, X-ray therapy, physical therapy, ambulant surgery, and clinical pathology laboratory.

(4) Patient examination rooms will be needed at the rate of one for each fourth-year medical student plus one for each four house staff members. Additional examination rooms will be provided for private patients and children under 6 years old, and for eye, ear, nose, throat, and dental diagnosis and treatment. Psychiatric examination rooms should be provided with one-way mirrors between them and adjacent observation rooms. A one-way mirror should be provided in the children's playroom for observing their activities from outside the room. The mirror should be low enough to permit observing a child playing on the floor at any location within the playroom.